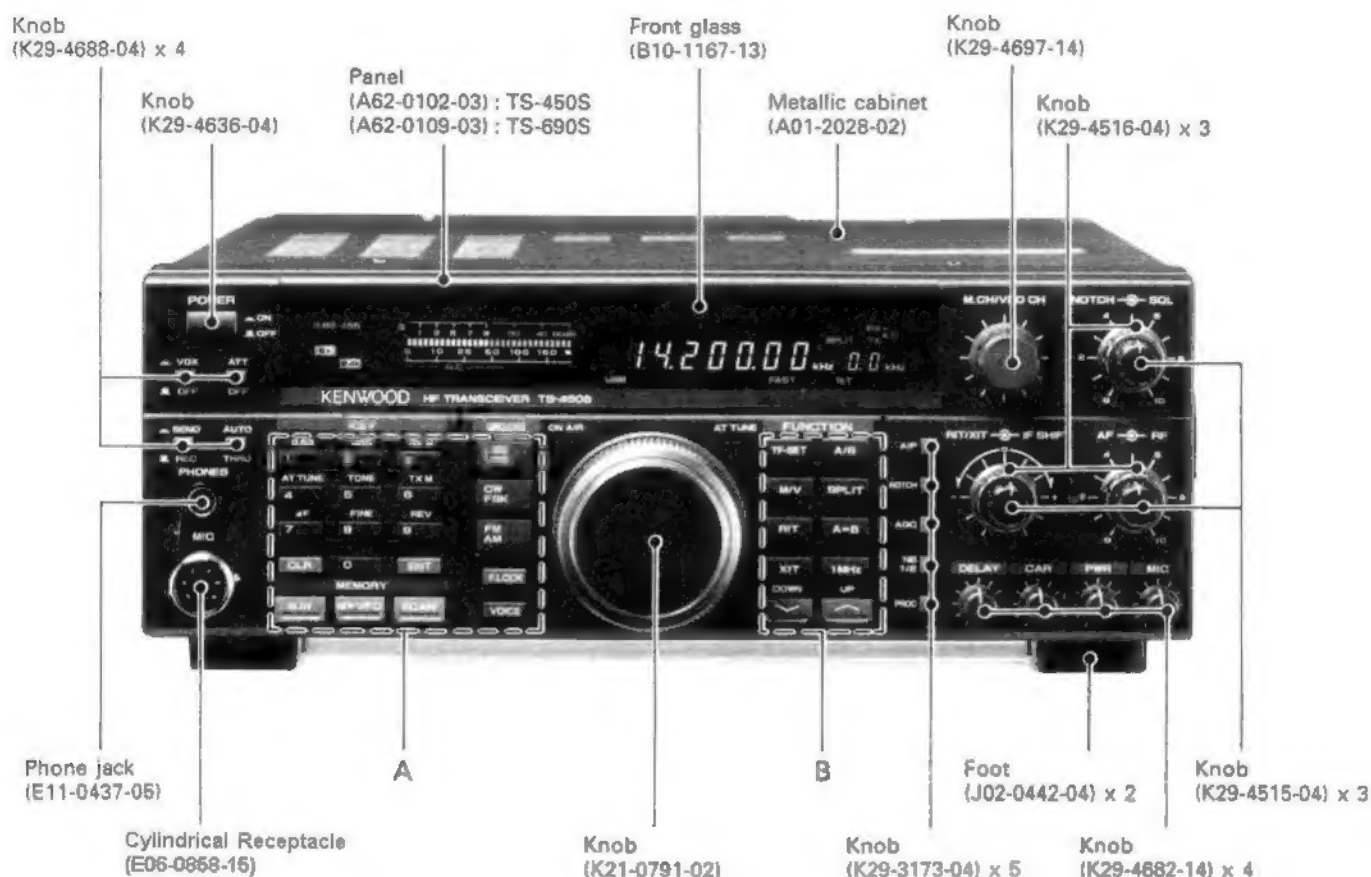


TS-450S/690S

SERVICE MANUAL

KENWOOD



A

| | | | |
|--------------------|--------------------|--------------------|--------------------|
| Knob (K29-4611-03) | Knob (K29-4612-03) | Knob (K29-4613-03) | Knob (K29-4633-03) |
| Knob (K29-4614-03) | Knob (K29-4615-03) | Knob (K29-4616-03) | Knob (K29-4634-03) |
| Knob (K29-4617-03) | Knob (K29-4618-03) | Knob (K29-4619-03) | Knob (K29-4635-03) |
| Knob (K29-4621-03) | Knob (K29-4620-03) | Knob (K29-4622-03) | Knob (K29-4630-03) |
| Knob (K29-4505-04) | Knob (K29-4506-04) | Knob (K29-4507-04) | Knob (K29-4626-03) |

B

| | |
|--------------------|--------------------|
| Knob (K29-4689-03) | Knob (K29-4693-03) |
| Knob (K29-4690-03) | Knob (K29-4694-03) |
| Knob (K29-4691-03) | Knob (K29-4695-03) |
| Knob (K29-4692-03) | Knob (K29-4696-03) |
| Knob (K29-4508-04) | Knob (K29-4509-04) |

Photo is TS-450S.

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CIRCUIT DESCRIPTION

Overview

The TS-450S/690S series consists of the following models:

- TS-450S with AT (For HF)
- TS-450S without AT (For HF)
- TS-690S without AT (For HF plus 50-MHz band) (An optional AT can be built in.)

The receive frequency range is 100kHz to 40MHz for the TS-450S, and 100kHz to 60MHz for the TS-690S. (For the performance guarantee range, see the ratings.)

The local oscillator system uses a DDS (direct digital synthesizer) with a 1Hz resolution and the stability of single-crystal frequency management.

1) Features

- Primary operation mode in which the minimum panel functions necessary for transmission are available
- High receive performance by triple conversion
- Optional filters (8.83MHz x 2, 455kHz x 1)
- High receive sensitivity in the 28 and 50MHz bands (AIP off)
- High intercept point in the 28MHz and 50MHz bands (AIP on)
- Switches, such as AIP and AGC, are controlled by the microcomputer, and can be memorized.
- NB2 is built in.
- The DSP-100 and AT-300 can be connected.

Units for Each Model and Destination

| Parts No. | Unit name | TS-690S | | | | | | TS-450S | | | | | | | |
|--------------|------------------------|---------|-----|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|-----|--|
| | | K | X | P | E | E2 | M | K | X | P | E | E2 | M | M2 | |
| | | 011 | 071 | 101 | 271 | 272 | 021 | 011 | 071 | 101 | 271 | 272 | 021 | 022 | |
| X41-3170-00 | Switch unit | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| X44-3130-00 | RF unit | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| X44-3130-01 | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| X45-3400-00 | Final unit (HF 100W) | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| X45-3400-01 | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| X45-3420-00 | Final unit (50MHz 10W) | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| X45-3430-00 | Final unit (50MHz 50W) | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| X46-3120-11 | Digital unit | 1 | | 1 | | | | | | | | | | | |
| X46-3120-12 | | | | | | | | 1 | | 1 | | | | | |
| X46-3120-21 | | | 1 | | | | 1 | | | | | | | | |
| X46-3120-22 | | | | | | | | | 1 | | | | 1 | | |
| X46-3120-23 | | | | | | | | | | | | | | 1 | |
| X46-3122-71 | | | | | 1 | | | | | | | | | | |
| X46-3122-72 | | | | | | | | | | | 1 | | | | |
| X46-3122-73 | | | | | | | 1 | | | | | | | | |
| X46-3122-74 | | | | | | | | | | | | 1 | | | |
| X48-3090-00 | | IF unit | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | |
| X48-3090-01 | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| X50-3150-00 | PLL unit | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| X50-3150-01 | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| X50-3160-00 | CAR unit | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| X51-3110-00 | Filter unit | 1 | 1 | 1 | 1 | 1 | | | | | | | | | |
| X51-3110-01 | | | | | | | | 1 | 1 | 1 | 1 | 1 | | | |
| X51-3110-21 | | | | | | | 1 | | | | | | | | |
| X51-3110-22 | | | | | | | | | | | | | 1 | 1 | |
| X53-3370-00* | AT unit | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |

* Models with and without AT.

CIRCUIT DESCRIPTION

List of Destinations

| Model | Destination | Destination code | Remarks |
|---------|-----------------|------------------|------------------------|
| TS-690S | North America | K | 50MHz, 100W without AT |
| TS-690S | Australia | X | 50MHz, 100W without AT |
| TS-690S | Canada | P | 50MHz, 100W without AT |
| TS-690S | Europe | E | 50MHz, 100W without AT |
| TS-690S | Belgium | E2 | 50MHz, 100W without AT |
| TS-690S | Other countries | M | 50MHz, 100W without AT |
| TS-450S | North America | K | 100W without AT |
| TS-450S | Australia | X | 100W without AT |
| TS-450S | Canada | P | 100W without AT |
| TS-450S | Europe | E | 100W without AT |
| TS-450S | Belgium | E2 | 100W without AT |
| TS-450S | Other countries | M | 100W without AT |
| TS-450S | Other countries | M2 | 100W without AT |
| TS-450S | North America | K | 100W with AT |
| TS-450S | Australia | X | 100W with AT |
| TS-450S | Canada | P | 100W with AT |
| TS-450S | Europe | E | 100W with AT |
| TS-450S | Belgium | E2 | 100W with AT |
| TS-450S | Other countries | M | 100W with AT |
| TS-450S | Other countries | M2 | 100W with AT |

Accessories

| Parts name | Part No. | K | M | M2 | E | E2 | X | P |
|--------------------------------------|-------------|---|---|----|---|----|---|---|
| Instruction manual | B62-0095-00 | 1 | | | | | 1 | |
| Instruction manual | B62-0096-00 | | 1 | 1 | 1 | 1 | | 1 |
| Instruction manual | B62-0097-00 | | | | 1 | 1 | | |
| External control command description | B62-0099-00 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Warranty card | B46-0419-00 | | | | 1 | 1 | | |
| Warranty card | B46-0410-30 | 1 | | | | | | |
| Warranty card | B46-0422-00 | | | | | | | 1 |
| 7-pin DIN plug | E07-0751-05 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 13-pin round plug | E07-1351-05 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Microphone | T91-0352-15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Marker cord | E31-2154-05 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| DC cord | E30-3035-05 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Fuse (25A) | F51-0011-05 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Fuse (4A) | F06-4029-05 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Knob | k23-0712-04 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note : There is no TS-690S for M2.

Caution in Removing (Bottom) Cabinet

For a cabinet assembly fitted with an optional filter, a portion of the filter is exposed from the chassis when a lower casing is removed from the cabinet. If the cabinet is put on a working desk as is, PC board fitted with the filter may be destroyed due to weight of the cabinet assembly.

When removing the lower casing, take care so that the filter is not in touch with a working desk, etc.

CIRCUIT DESCRIPTION

Frequency Configuration

The TS-690S/450S uses triple conversion in receive mode, double conversion in CW and FM transmit modes, and triple conversion in SSB, AM, and FSK transmit modes.

When the DSP-100 (digital signal processor) is installed, the 36.892kHz IF (fourth IF) signal goes to the DSP unit during reception; during transmission, the input signal from the microphone or key goes to the DSP unit, and a 455kHz signal goes to the main unit according to the mode. The DSP only produces a 455kHz carrier in FM mode, and the VCOs for modulation operate in the same way as when there is no DSP.

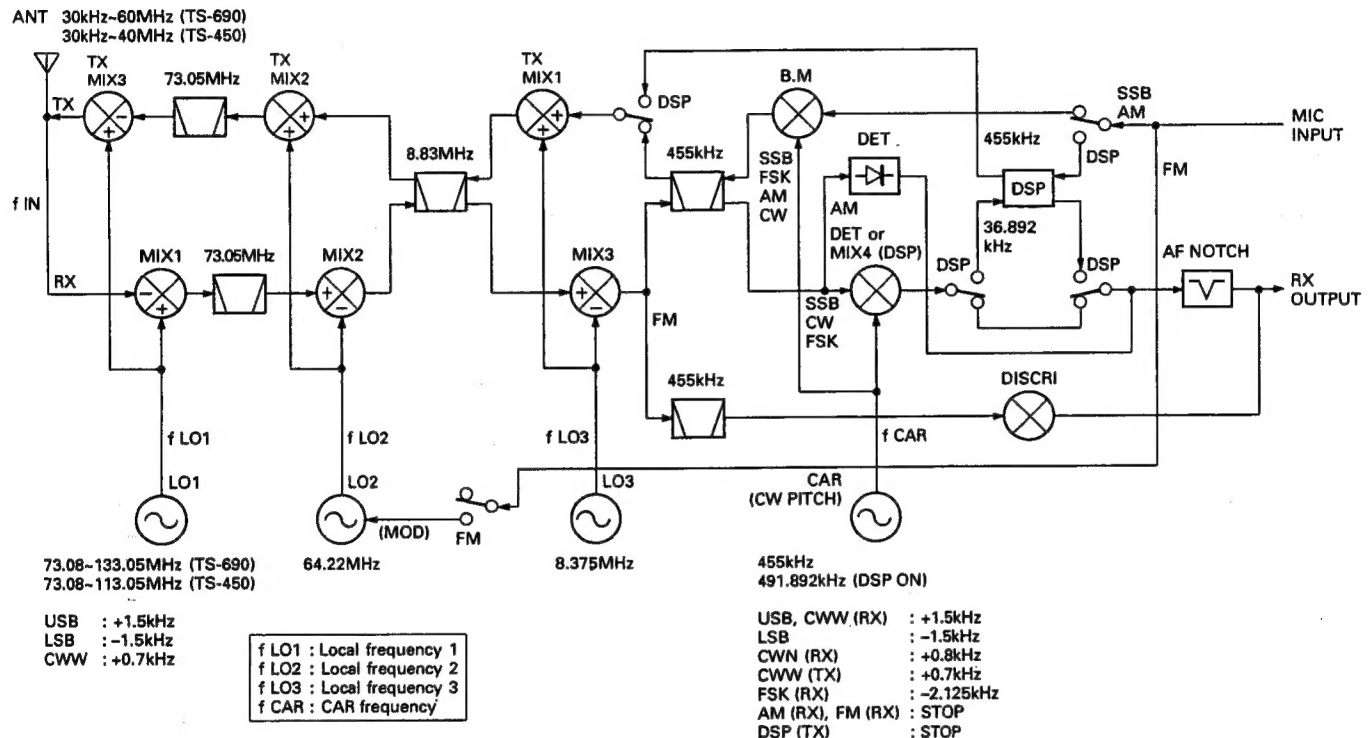


Fig. 1 Signal system frequency configuration

1) Frequency configuration

The receiver frequency in SSB mode is given by the following equation when the receiver tone produced by the input frequency (f_{IN}) from the antenna is zero beat (when an SSB signal with a carrier point of f_{IN} is zeroed in):

$$f_{IN} = f_{LO1} - f_{LO2} - f_{LO3} - f_{CAR} \dots \dots \dots (1)$$

Since f_{LO3} is generated by a crystal oscillator, and is input as a cancel loop* to the PLL circuit that generates f_{LO1} (as shown in Fig. 2), the receiver frequency is determined only by reference frequency f_{STD} , the PLL divide ratio, and DDS data. So the stability/accuracy of the reference frequency determines the overall frequency stability/accuracy of the transceiver.

The stability/accuracy of the reference crystal oscillator used in the TS-690S/450S is 10 ppm (-10 to +50°C). The stability/accuracy of the optional temperature-compensated crystal oscillator (TCXO, SO-2) is 0.5 ppm (-10 to +50°C).

The TS-690S/450S local oscillator and the CAR DDS circuits are independent of each other. However, they can be operated in a way similar to a cancel loop* configuration by changing the CAR and local oscillator data simultaneously by means of the microprocessor. This function allows changes in the f_{CAR} and f_{LO1} lines when the mode changes.

* The cancel loop is described in section 9 of PLL circuit configuration.

TS-450S/690S

CIRCUIT DESCRIPTION

In transmit SSB mode or in other modes, the frequency is determined by the reference frequency (f_{STD}) and the PLL divide ratio. The display frequencies in the various modes are listed in Table 1. (In FSK mode, the TS-690S/450S displays the mark transmitter frequency.)

The pitch of the incoming signal in CW mode can be varied in 50Hz steps in the range 400 to 800Hz without changing the center frequency of the IF filter (variable CW pitch system).

Transmission in FM mode is carried out by applying the audio signal from the microphone to VCO2 and modulating f_{LO2}.

CAR is stopped by the DSP during reception in AM and FM modes and during transmission. When the DSP unit is connected, f_{CAR} is switched to the signal output from the DSP, and the carrier point is fixed at 455kHz during transmission.

Since the reference for the DSP is based on f_{STD}, the stability/accuracy of the operating frequency is unchanged even when the DSP is connected.

| Mode | Display frequency |
|----------|----------------------------|
| USB, LSB | Carrier point frequency |
| CW | Transmit carrier frequency |
| FSK | Mark transmit frequency |
| AM, FM | IF filter center frequency |

Table 1 Display frequency in each mode

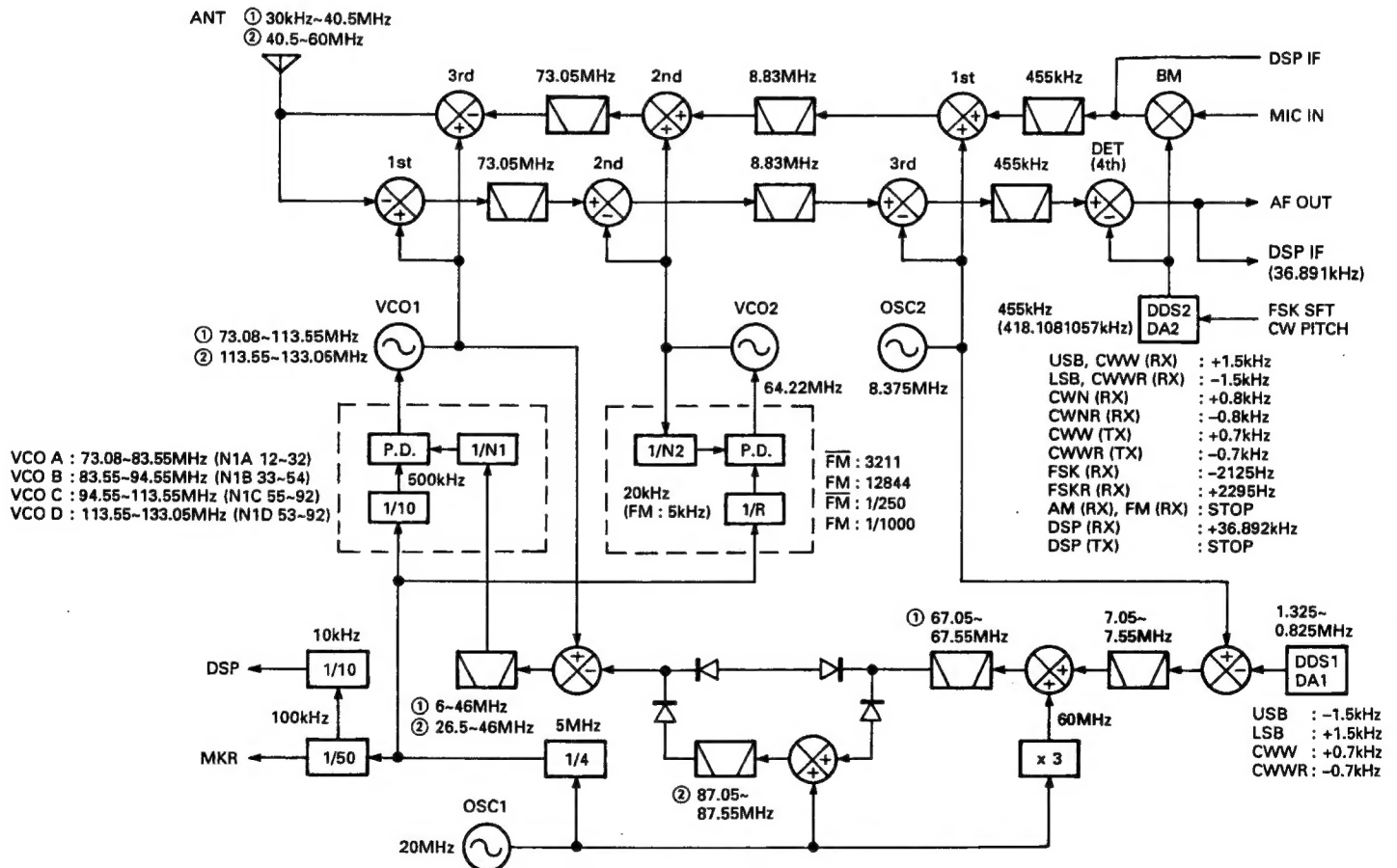


Fig. 2 PLL circuit frequency configuration

CIRCUIT DESCRIPTION

PLL Circuit Configuration

The TS-690S/450S PLL circuit comprises (1) a reference oscillator circuit (Ref. OSC), (2) an LO2 PLL loop, (3) an LO1 PLL loop, (4) a crystal oscillation circuit that generates LO3, and (5) a DDS that generates CAR and comprises a DLO PLL loop and a CAR signal generation circuit. These circuits are described below.

The divide ratio and DDS data to the PLL loops are controlled by the microprocessor, and all frequencies are based on the reference frequency (fSTD) using the single-crystal frequency management method. Figure 2 shows the frequency configuration of the PLL circuit. Figure 3 is a PLL block diagram.

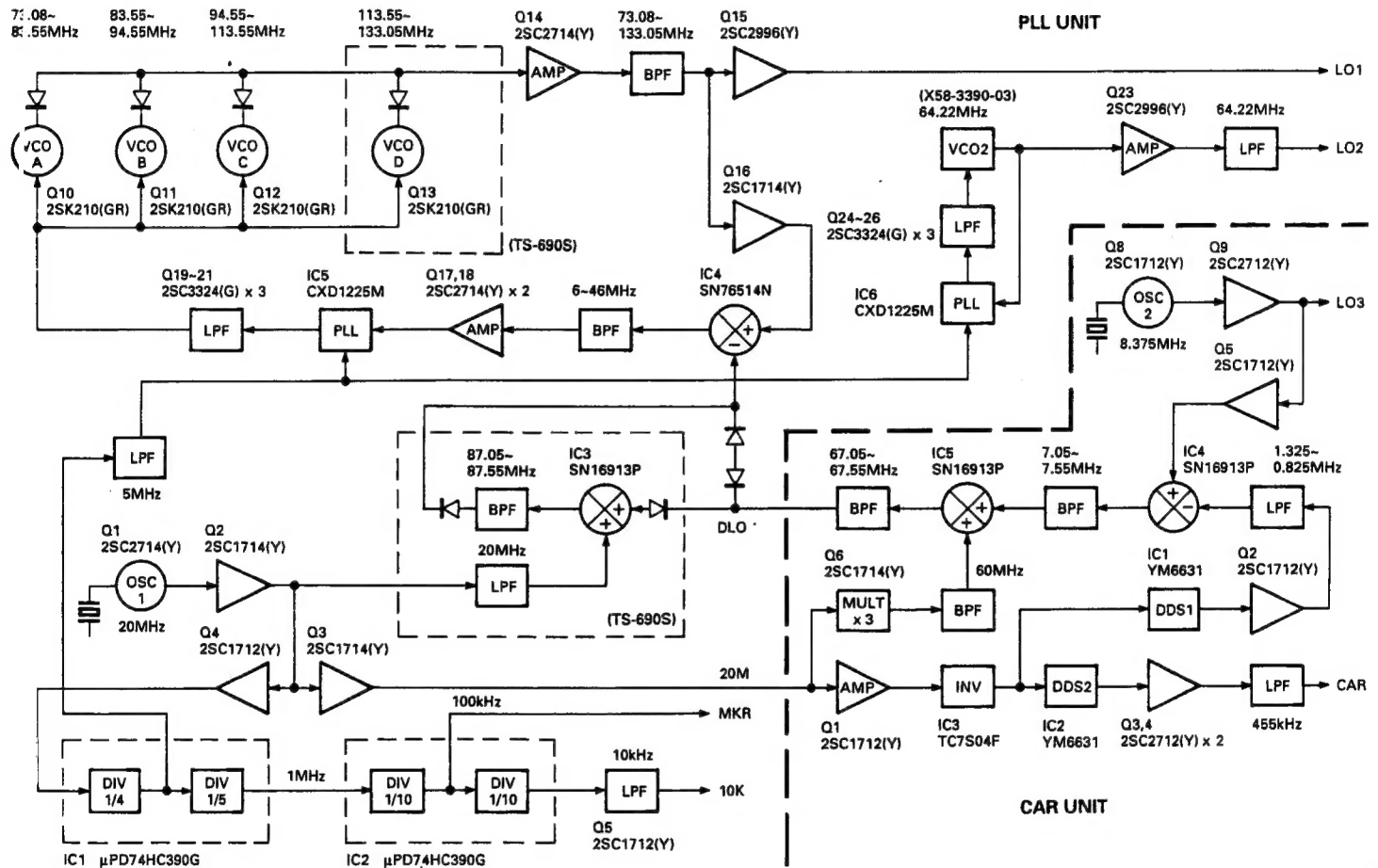


Fig. 3 PLL block diagram

1) Reference oscillator circuit (PLL unit OSC1)

The reference frequency (fSTD) used for frequency control is generated by the 20MHz crystal oscillator, X1 and Q1 (2SC2714). Two outputs are provided; one is used as the 20MHz reference frequency for the CAR unit, and the other is divided by four by IC1 (μ PD74HC390G) to produce a 5MHz PLL reference signal fREF for other circuits, which goes to IC5 and IC6 (CXD1225M). The 5MHz signal is divided by five to

produce a 1MHz signal, which is divided by 10 and 100 by IC2 (μ PD74HC390G). A 100kHz marker signal appears at TP1, and the 10kHz signal passes through active low-pass filter Q5 (2SC2712), and is output as the reference signal for the optional DSP-100.

Crystal oscillator circuit OSC1 can be replaced by an optional TCXO (SO-2). The TCXO can be switched to by cutting jumper resistors W4 and W5.

CIRCUIT DESCRIPTION

2) LO2 (PLL loop)

Q1 (2SK508NV) of VCO2 (X58-3390-03) generates a signal of 64.22MHz. The 5MHz reference frequency (fREF) is applied to pin 5 of IC6 (CXD1225M), and is divided by 250 (1000 in FM mode) internally to produce a 20kHz (5kHz in FM mode) comparison frequency. The output from VCO2 is applied to pin 11 of IC6, and is divided by 3211 (12844 in FM mode) internally. It is then compared with the 20kHz (5kHz in FM mode) reference signal by the phase comparator to lock the VCO2 frequency. Divide ratio data is supplied by the digital circuit.

The output is amplified by amplifier Q23 (2SC2996) and passes through a low-pass filter. The impedance is converted and the signal is output.

3) LO1 (PLL loop)

Four VCO1s, Q10 to Q13 (2SK210 x 4; three VCO1s, Q10 to Q12, for the TS-450S), generate 73.08 to 133.05MHz signals (73.08 to 113.05MHz signals for the TS-450S). The 5MHz reference signal (fREF) is applied to pin 5 of IC5 (CXD1225M) and is divided by 10 internally to produce a 500kHz comparison frequency. The output signal from VCO1 passes through amplifier Q14 (2SC2714) and a band-pass filter, and is divided into two signals. One signal is output to the RF unit, the other is applied to pin 5 of mixer IC4 (SN76514N). For VCOA, the band-pass filter narrows the band and reduces the harmonic level by switching.

The 67.05 to 67.55MHz DLO output from the CAR unit is input directly to pin 11 of mixer IC4 if VCO1 is 73.08 to 113.55MHz (VCOA to C). If VCO1 is 113.55 to 133.05MHz (VCOD), the PL0 signal and 20MHz fSTD are mixed by mixer IC3 (SN16913P). The signal of 87.05 to 87.55MHz is applied to pin 11 of mixer IC4. This switching is done according to the BCH data from the digital unit. The signal passes through the band-pass filter, becomes a signal of 6 to 46MHz and one of 26.5 to 46MHz, passes through amplifiers Q17 and Q18 (2SC2714 x 2), and is applied to pin 13 of IC5.

This signal is divided by N1 internally, compared with a 500kHz signal by the phase comparator, and the mixer output frequency is locked in 500kHz steps. Divide ratio N1 is sent from the digital unit as data (12 to 92, 53 to 92) that covers 30kHz to 40.5MHz, 40.5 to 60MHz) in 500kHz steps. One of the four VCOs is selected according to the VCO switching data from the digital unit.

DLO sweeps in 10Hz or 1Hz steps. The LO1 output covers 73.08 to 133.05MHz in 10Hz or 1Hz steps, and is output to the RF unit.

| Local oscillator | VCO | PLL IC | Comparison freq/ division ratio R | Variable division ratio N | VCO frequency (MHz) |
|------------------|------|--------|--------------------------------------|------------------------------|------------------------|
| LO1 | VCOA | IC5 | 500kHz/10 | 12-32 | 73.08-83.55 |
| | VCOB | | | 33-54 | 83.55-94.55 |
| | VCOC | | | 55-92 | 94.55-113.55 |
| | VCOD | | | 53-92 | 113.55-133.05 |
| LO2 | VCO2 | IC6 | 20kHz/250 5kHz/1000 : FM | 3211 12844 : FM | 64.22 |

Table 2 PLL data and frequency

4) Unlock signal (PLL unit)

If each PLL loop is unlocked, pins 8 of IC5 and IC6 go low, and the signal passes through the inverter and goes to the digital unit as a high UL signal. The micro-processor puts up " " (decimal points only) on the display or outputs the RBK or ABK signal.

5) DDS reference signal (CAR unit)

The 20MHz reference signal from the PLL unit is amplified by Q1 (2SC2712), buffered by inverter IC3 (TC7S04F), and supplied to pin 55 (CLK) of IC1 and IC2 (YM6331). This signal is halved by IC1 and IC2 to produce a 10MHz DDS reference signal.

6) DLO (CAR unit)

A digital signal of 1.325 to 0.825MHz is generated by IC1 (YM6331), converted to analog by the digital-to-analog (D/A) converter comprising CP1, CP2, and Q2 (2SC2712), passed through a low-pass filter, and applied to mixer IC4 (SN16913P), where it is mixed with a 8.375MHz signal (LO3). The resulting signal passes through a band-pass filter to produce a signal of 7.05 to 7.55MHz. The signal is input to mixer IC5 (SN16913P), where it is further mixed with the 60MHz signal converted by double circuit Q6 (2SC2714), passes through a band-pass filter, and goes to the PLL unit as signal DLO of 67.05 to 67.55MHz.

7) LO3 (CAR unit)

Local oscillator signal LO3 is generated by 8.375MHz crystal oscillator X1 and Q8 (2SC2712), and is split into two signals. One signal is output to the LO1 PLL cancel loop, and goes to mixer IC4 (SN16913P). The other signal is output to the RF unit as LO3. The local oscillator signal from the crystal oscillator circuit is input to the PLL loop to cancel drift.

CIRCUIT DESCRIPTION

8) CAR (CAR unit)

A digital signal of about 455kHz is generated by IC2 (YM6331), converted to an analog signal by the D/A converter comprising CP3, CP4, and Q3, Q4 (2SC2712 x 2), passed through a low-pass filter, and output to the IF unit as the CAR signal.

When receiving in AM and FM modes and DSP transmitting, DDS generation stops. The modes, such as SSB, CW, and FSK, are switched, the IF shift and carrier point are adjusted finely, and the pitch is changed in CW mode. In FSK mode, FSK modulation is performed directly by IC2 using an external RTK signal.

9) Cancel loop

If the local oscillator is a crystal oscillator or LC oscillator, there is frequency drift due to the temperature characteristics of the circuit and the operating frequency. The frequency configuration shown in Figure 4 is used to cancel the oscillator frequency drift.

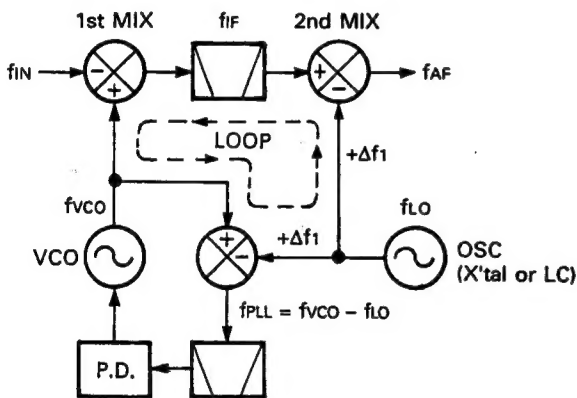


Fig. 4 Cancel loop (OSC)

If the oscillator shifts by $+\Delta f_1$ due to temperature drift, f_{IF} shifts by $f_{IF} + \Delta f_1$, and f_{VCO} shifts by $f_{VCO} + \Delta f_1$ to make f_{IN} and f_{AF} equal. The VCO frequency is mixed with the oscillator frequency in the PLL loop, is made equal to frequency f_{PLL} before drift occurs ($(f_{VCO} + \Delta f_1) - (f_{LO} + \Delta f_1) = f_{VCO} - f_{LO}$), and the PLL is kept locked. A loop in which the oscillator temperature drift does not affect frequencies f_{IN} and f_{AF} is called a cancel loop.

10) DDS circuit configuration

The DDS IC has been developed with standard cells to implement a high-speed circuit and large-capacity ROM at low cost.

• IC configuration

IC configuration is as follows:

There are two 28-bit registers for setting frequency data, one 28-bit frequency shift register for addition to the frequency registers, a 23-bit parallel signal input section for frequency modulation with parallel signals, and a data entry and selection section.

There is a frequency-modulation section comprising 28-bit adders for adding frequency data and frequency modulation data; a phase data operation section that adds data from the frequency modulation section and 28-bit phase data register; and a SIN-ROM that converts phase data to sine waves.

• Frequency/shift data setting

Using serial signals synchronized with clock pulses, 30 bits (2 bits that specify the destination for which data is set, and 28 bits of frequency data) are set in the three internal registers.

• Frequency register selection

The data set in the two frequency registers is selected by the SLAB input of the DDS IC. This pin handles the ABSL signal for IC1, and the CASL signal for IC2. This function eliminates the need for the TS-690S/450S to set frequency data for each transmission/reception with the microprocessor.

• Frequency data selection

The SPSL input of the DDS IC selects whether to use the data in the internal frequency shift register or the data from the parallel input as frequency modulation data.

• Frequency modulation

The MDEN input of the DDS IC enables or disables frequency modulation. When frequency modulation is enabled, frequency data is added, and the result is input to the phase data operation section.

CIRCUIT DESCRIPTION

• Phase data operation

The target frequency phase data is output by accumulating 28-bit frequency data in the 28-bit phase accumulator.

$$F_{out} = F_s / 2^{28} \cdot D_{sum}$$

Where:

F_s : DDS IC input frequency/2

D_{sum} : Frequency data + Frequency modulation data

If 2^{25} is set for D_{sum} when $1/8 F_s$ is output, the phase data must be increased by $\pi/8$.

So far, 28-bit absolute value operation has been used, but a 28-bit signed operation can also be used, assuming that the MSB is a sign. If complement data of 8000000 to FFFFFFFF (hex) is set, the phase moves in the negative direction for positive data.

• SIN ROM

Phase data from the phase data operation section is converted to sine wave data of 0000 to FFFF (hex) in 16-bit offset binary format.

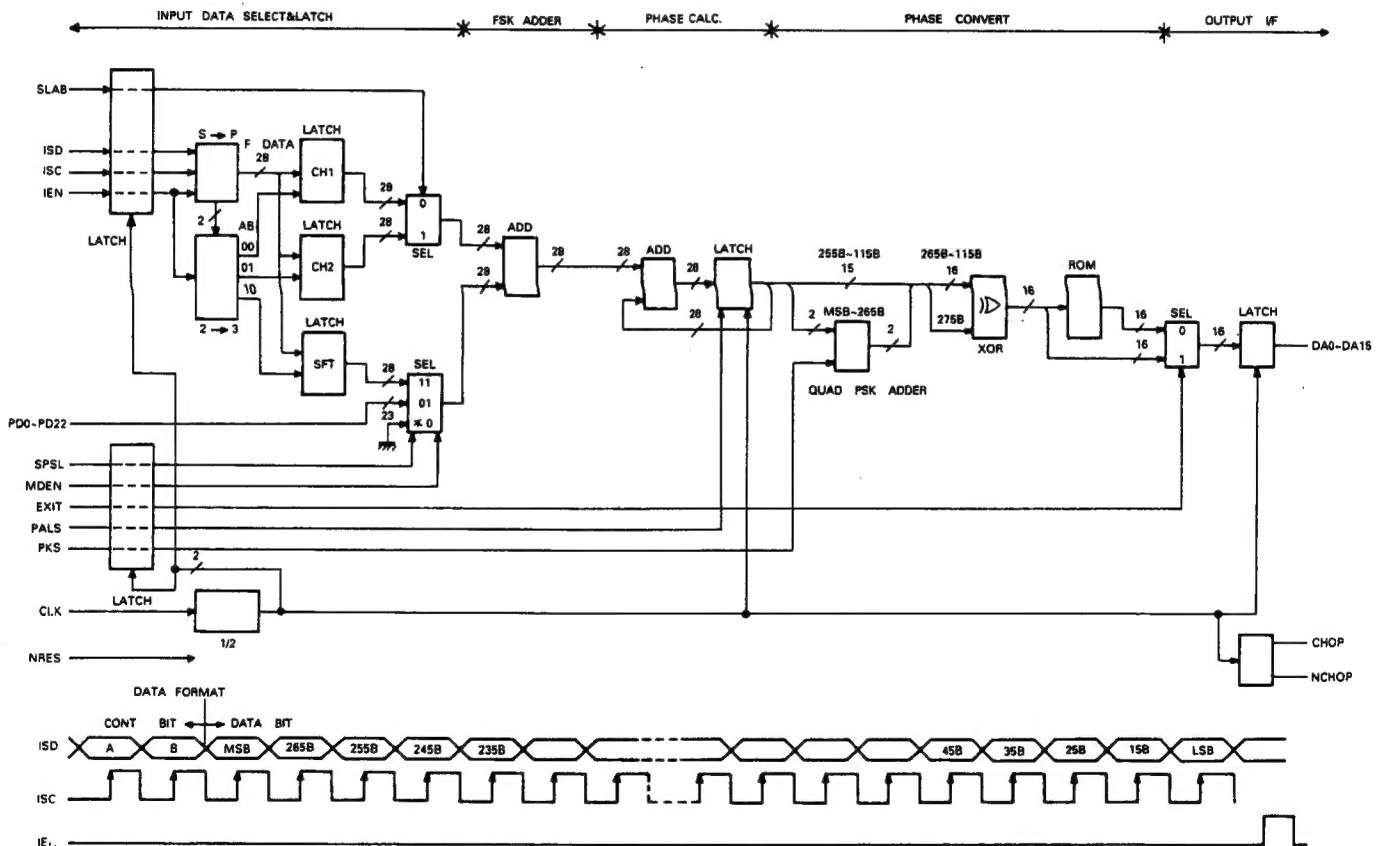
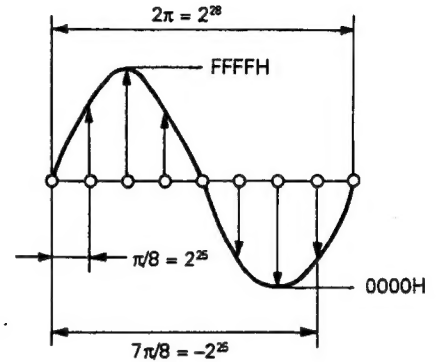


Fig. 5 DDS IC (YM6631) block diagram and data format

CIRCUIT DESCRIPTION

Receiver Circuit Configuration

The configuration of the receiver circuit is triple-conversion with a first IF of 73.05MHz, a second IF of 8.83MHz, and a third IF of 455kHz.

The incoming signal from the antenna passes through the antenna switch relay on the filter unit, and goes to the RF unit. The signal passes through a 20-dB attenuator and IF trap (low-pass filter) in the RF unit, is divided by 10 (or 9 for the TS-450S), and is applied to the band-pass filter (low-pass filter for 500kHz or less). For 1.6MHz or more, the signal passes through a high-pass filter to prevent interference from a high-output MF-band station.

The band-pass filter of 21.5 to 40.5MHz and 40.5 to 60MHz (21.5 to 40.5MHz only for the TS-450S) is followed by a preamplifier (2SK520) to improve the sensitivity. The preamplifier works only if AIP is off. If AIP is on, the preamplifier is bypassed to increase the dynamic range.

If AIP is off, the signal passing through the band-pass filter passes through the NFB amplifier comprising Q9 and Q10 (2SK520 x 2) connected in parallel. If AIP is on, the NFB amplifier is bypassed to increase the dynamic range. The signal passes through the IF track (low-pass filter), and is mixed with signal LO1 by first mixer Q14 to Q17 (2SK520 x 4) to produce a first IF signal of 73.05MHz.

The first IF signal of 73.05 MHz passes through the MCF (X1), is amplified by Q25 (3SK131), and mixed with the 64.22MHz LO2 signal by the second mixer Q26 and Q27 (2SK520 x 2) to produce a second IF signal of 8.83MHz.

The second IF signal of 8.83MHz is split into two signals. One goes to the NB amplifier, and the other passes through NB gate FET Q28 (3SK131) and then through one of the four types of 8.83-MHz IF filter: through, 6kHz, 2.4kHz, and 500Hz (2.4kHz and 500Hz are optional). The desired filter can be selected from the front panel.

The signal passing through the IF filter is mixed with the 8.375MHz LO3 signal by third mixer Q29 and Q30 (3SK131 x 2) to produce a third IF signal of 455kHz, which goes to the IF unit.

The signal is then amplified by Q2 (3SK131), and goes to a 455kHz IF filter. There are four types of 455kHz IF filter: 12kHz, 6kHz, 2.4kHz, and 500Hz (500Hz is optional), one of which can be selected from the front panel in the same way as for the 8.83MHz IF filter.

The signal from the filter is amplified by Q3 and Q8 (3SK131 x 2) in modes other than FM, SSB, CW, and FSK modes are detected by IC1 (μ PC1037HA), and AM mode is detected by D15 (1N60). In FM mode, the signal is limit-amplified and detected by IC4 (MC3361D). The AF signal for each mode after detection passes through the select and notch modules, and goes to AF preamplifier Q30 (2SC2712).

The signal from the preamplifier passes through muting circuit Q31 (2SD1757K) and the AF potentiometer, and is amplified to the required level by AF power amplifier IC5 (μ PC2002V).

1) Receiver front-end

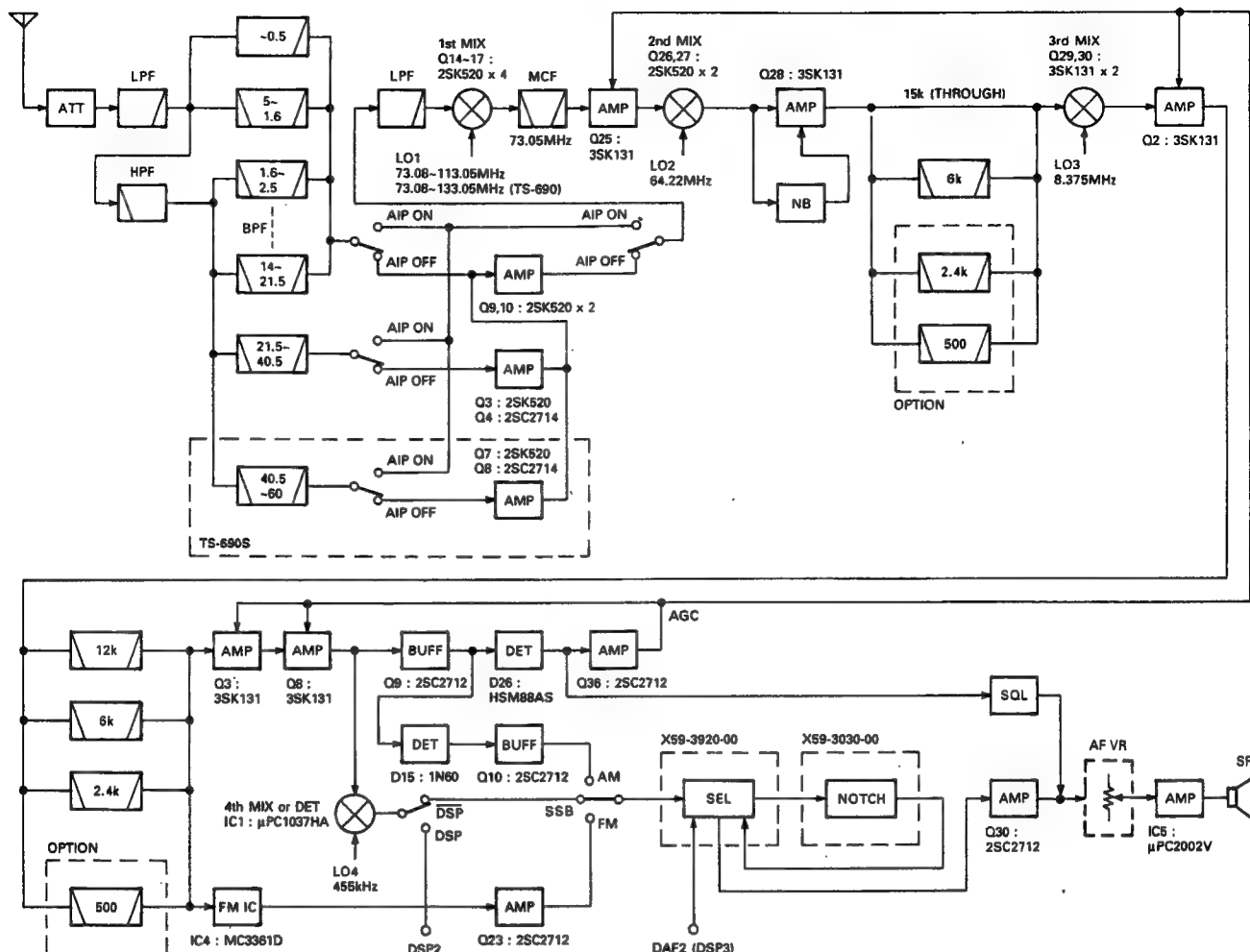
For the RF BPF of 21.5 to 40.5MHz, preamplifier Q3 (2SK520) and Q4 is connected, and for 40.5 to 60MHz, preamplifier Q7 (2SK520) and Q8 is connected, and the signal is amplified by about 10 dB if AIP is off. The 28C data goes high for 21.5 to 26.5MHz, and low for 26.5 to 40.5MHz to switch the tuning capacity of L35 by Q6 and change the peak frequency.

If AIP is off and the signal passing through each band-pass filter is 21.5MHz or less, it passes through D28, and if the signal is more than 21.5MHz, it is amplified by the preamplifier, passes through D25 or D26, and enters the NFB amplifier comprising two J-FETs, Q9 and Q10 (2SK520 x 2) connected in parallel and having good large input characteristics. It is amplified by about 15dB, passes through D30, and goes to the first mixer. If AIP is on and the signal is 21.5MHz or less, it passes through D27, and if it is more than 21.5MHz, it passes through D61 or D63, and D29, and enters the first mixer directly.

If AIP is off and the signal is more than 21.5MHz, the RF signal gain increases, and the signal-strength meter reading increases. To reduce it to the level before 21.5MHz or less, the 455-kHz IF signal level gain is reduced by switching Q13 and Q14, or Q16 and Q17 of the IF unit. This is done if AIPB is high and the 28MC or 50MC data is low.

TS-450S/690S

CIRCUIT DESCRIPTION



CIRCUIT DESCRIPTION

2) Noise blanker circuits

NB1 is a noise blanker circuit that blanks for short-period pulses such as ignition noise. The 8.83MHz IF signal generated from the first IF of 73.05MHz by the second mixer is amplified by noise amplifier Q31 to Q34, passes through buffer Q36, and is noise-detected by D53. This signal switches Q37 and turns on Q39 and Q40, and Q42 blanks the IF signal line according to the noise.

NB2 is a noise blanker circuit that blanks noise having a comparatively long period and a large pulse width, like woodpecker noise. The signal is noise-detected in the same way as for NB1, passes through the Q35 switch, and enters the NB2 module unit (X59-3350-00) to generate the pulse width and period synchronizing with the woodpecker noise.

IC1 (TC4011BF) in the module unit is set for a pulse width of 40 ms. Even short-period noise like an ignition pulse can be blanked by switching the noise, so the desired signal is not obtained. To prevent this, a one-shot multi is implemented using two IC1s so that the next pulse is not blanked for 40ms after one shot is issued.

When NB2 is on, NB1 also operates.

Both NB1 and NB2 fix the emitter voltage of Q37, keeping the threshold level constant.

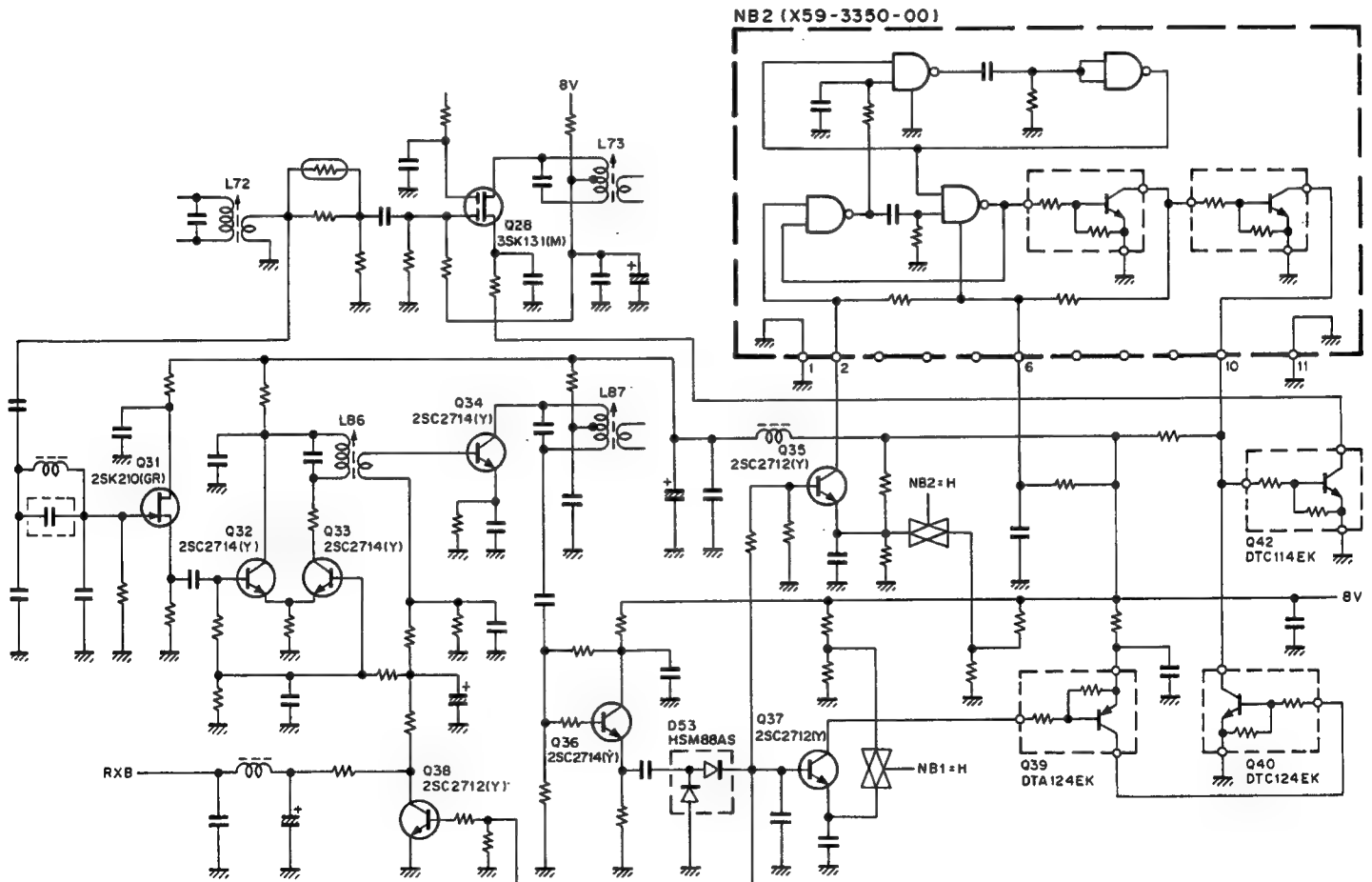


Fig. 8 NB circuit

CIRCUIT DESCRIPTION

3) Squelch circuit

In modes other than FM, the 455kHz IF signal is detected by D26, passed through Q24 and Q25, and a voltage proportional to the signal level appears at the base of Q26. When the SQL VR is turned clockwise, the emitter voltage of Q26 increases, and Q27 and Q40 are switched.

In FM mode, a voltage proportional to the FM noise level appears at pin 12 (squelch trigger input) of IC4.

As the IF signal increases, the noise level decreases, and the voltage at pin 12 of IC4 decreases, making pin 14 low. When the SQL VR is turned clockwise, the voltage at pin 12 of IC4 increases, and pin 14 goes high. Q27 and Q40 are switched as in modes other than FM.

Q31 turns on to mute the AF signal line, and Q41 turns on to ground pin PSQ of connector ACC2.

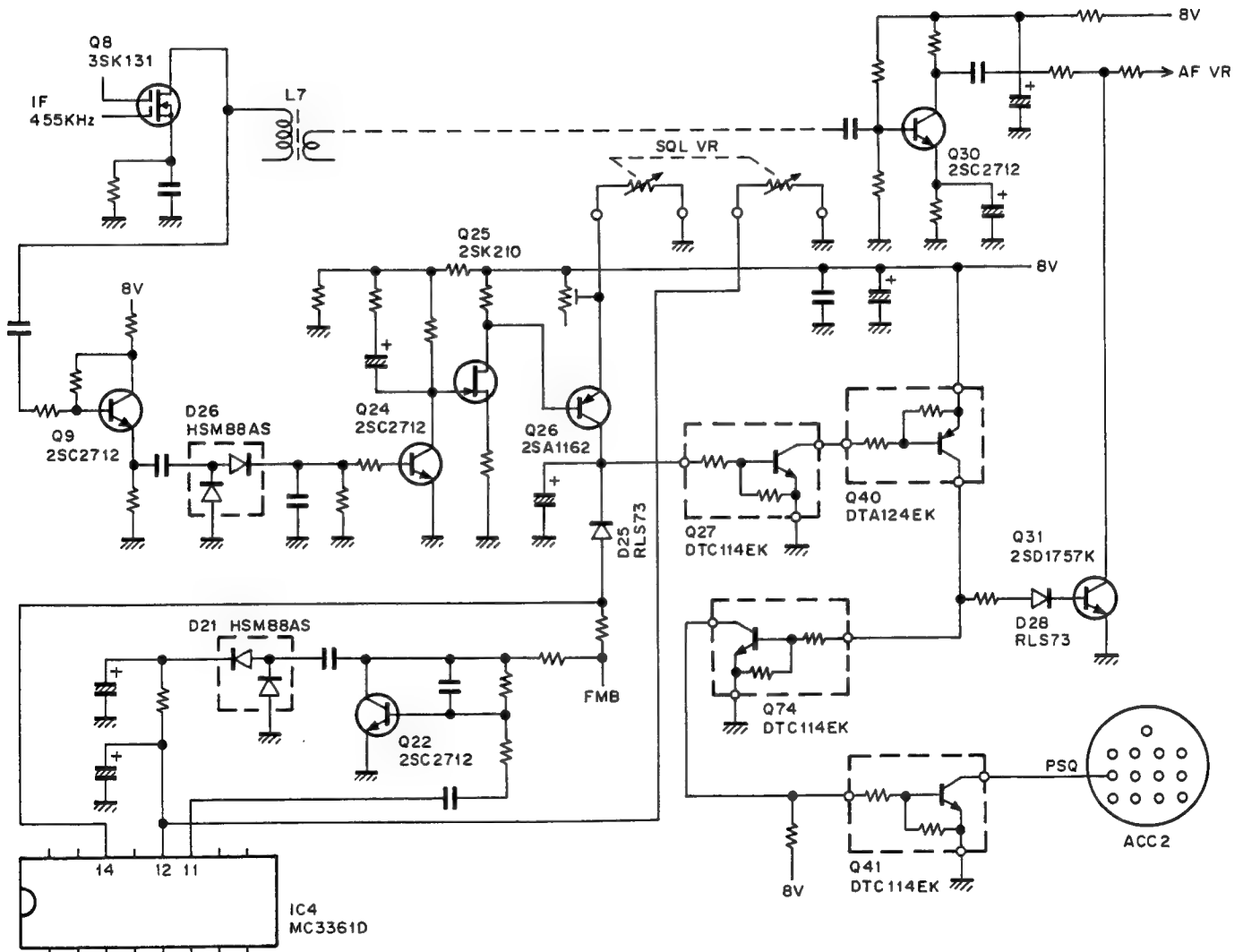


Fig. 9 Squelch circuit

CIRCUIT DESCRIPTION

4) Select circuit

If the DSP-100 is not connected, the AF signal after detection for each mode is input to pin 3 of the select module (X59-3920-00) and output from pin 9. If the DSP-100 is connected, IC1 becomes the fourth-mixer, and a 36.892kHz IF signal is output in SSB, CW, and FSK modes. This signal is amplified by Q29, input to the DSP-100 via pin DSP2, internally processed, and output to DSP3 pin DAF2, as an AF signal. The AF signal is input to pin 8 of the select module, and output from pin 9. In AM and FM modes and if the DSP-100 RX switch is off, the signal is input to pin 3 of the select module, and output from pin 9, as if the DSP-100 is not connected. The DAF1 signal is not used by the DSP-100.

The signal output from pin 9 of the select module is applied to pin 6 of the notch module. The signal passing through the notch filter and a flat signal are output from pin 2 (NOTCH) and pin 4 (FLAT), and input to the select module.

If NOTCH is on, the signal input from pin 2 of the notch module is output from pin 7, and if NOTCH is off, or in FM mode, the signal input from pin 4 is output from pin 7.

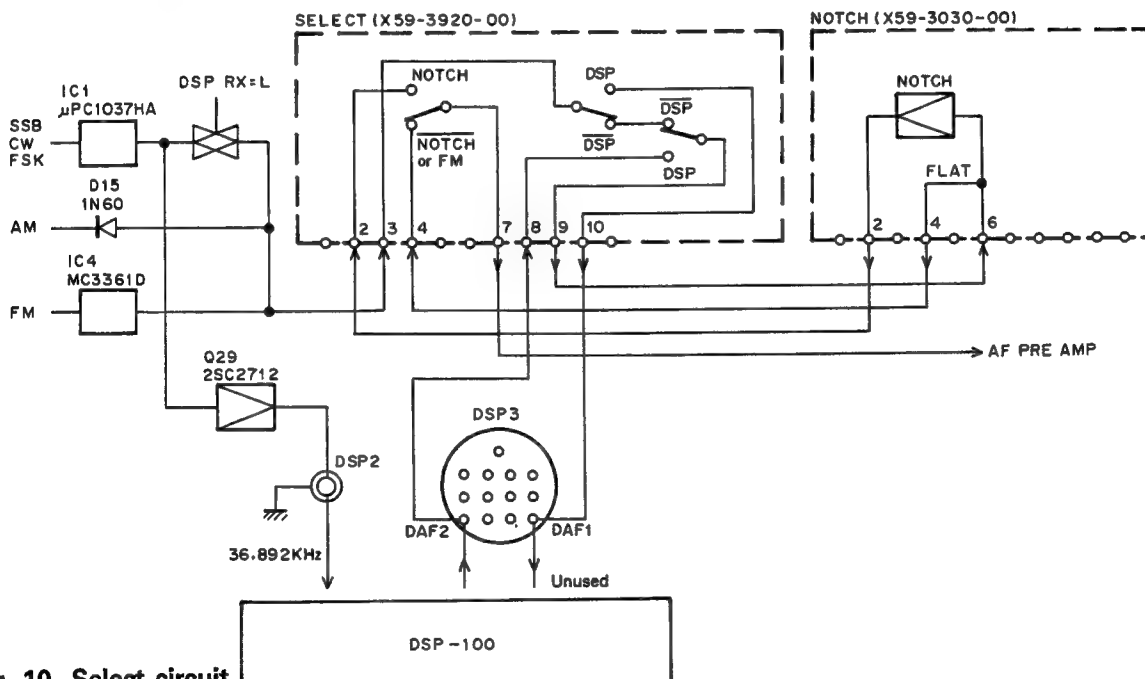


Fig. 10 Select circuit

5) Notch circuit

The notch circuit is an audio notch filter. The notch frequency can be varied in the range 450Hz to 3kHz with the NOTCH control.

Although an audio filter with a narrow null point is a superior technique, it is not easy to use because the notch point is difficult to obtain. So a notch filter having a wider bandwidth than normal is used.

The circuit uses a variable band-pass filter (peak filter) or bridged T active filter, and synthesizes notch characteristics by summing input/output signals. The module contains chips to improve its stability. Thus, the actual notch attenuation is 30 to 40dB in all variable ranges.

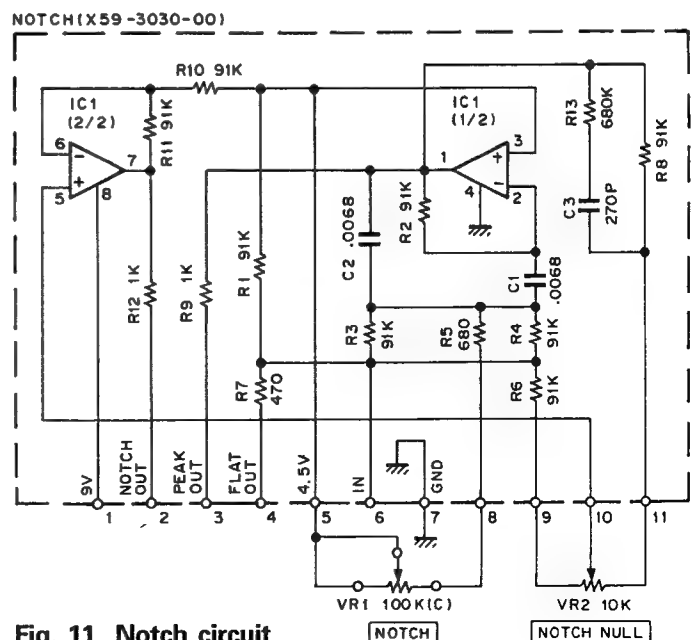


Fig. 11 Notch circuit

CIRCUIT DESCRIPTION

6) Signal-strength meter circuit

In modes other than FM, the signal-strength meter circuit comprises operational amplifier IC6 (1/2). The 455kHz IF signal is detected by D26, passes through Q36, and appears as the AGC voltage.

If the reference voltage of the signal-strength meter is applied to the + pin (pin 3) of reverse amplifier IC6 (1/2) and the AGC voltage is applied to the - pin (pin 2), the AGC voltage change is output from pin 1 to the digital unit as the SM signal. The reference voltage is the voltage immediately before the signal-strength meter is turned on by VR5 after the AGC voltage is adjusted to 3V when there is no signal.

In FM mode, the 455kHz FM IF signal is amplified by Q32 and Q33, and detected by D30. This voltage is output directly to the digital unit as the SM signal.

The digital unit converts the analog signal to a digital value, performs operations in non-FM mode in FM mode, and drives the meter.

The meter is adjusted with VR1 immediately after S1 is turned on when a 6dBμ SSG is input from the antenna, and S9 and S9 + 60dB are adjusted in each band in adjustment modes 8 to 10. In FM mode, only the signal-strength meter full scale is adjusted with VR4.

7) dB meter circuit

The AF signal output from AF preamplifier Q30 and amplified by Q38 becomes the ANO signal with a constant level regardless of the AF VR. This signal is amplified by Q39, and rectified by D31 to produce the db meter voltage. The voltage is connected to the ALC meter voltage by D69, and is output to the digital unit as the ALDB signal. If the output from pin ANO of connector ACC2 is 300mV at the 4.7kΩ termination, 0dB on the db meter goes on.

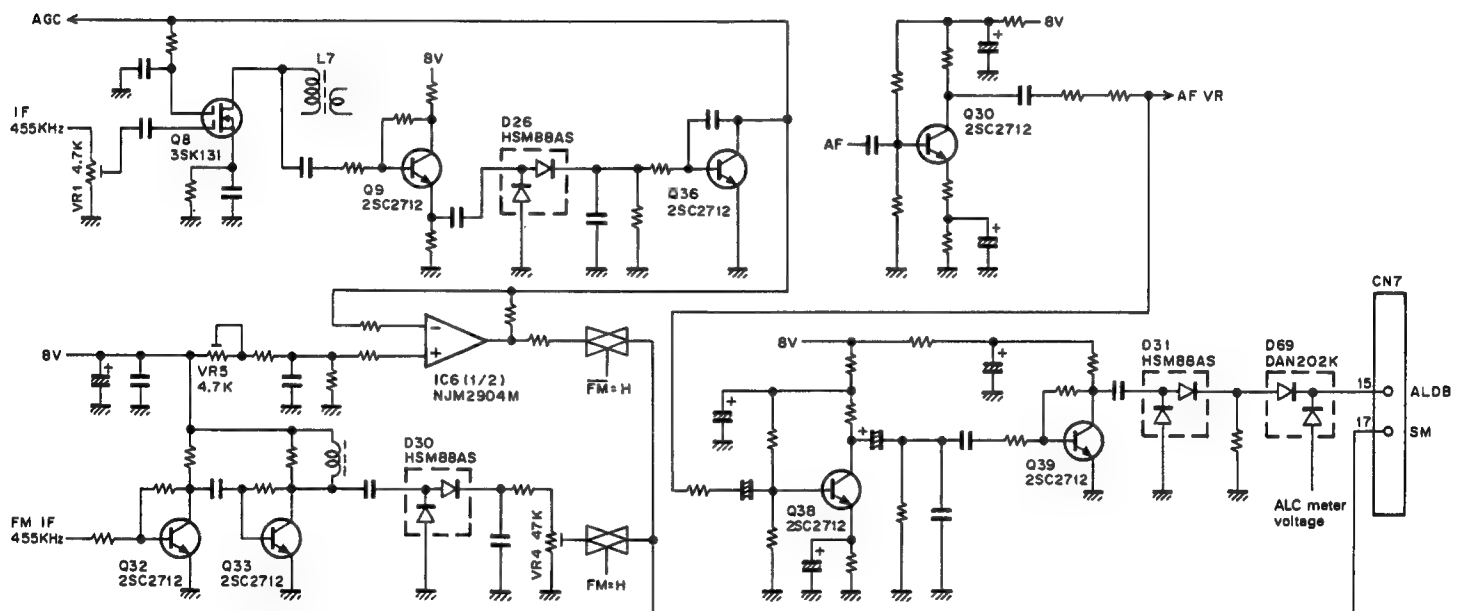


Fig. 12 AGC, signal-strength meter, and dB meter circuits

CIRCUIT DESCRIPTION

8) IF filter selection

Two optional 8.83MHz filters and one 455kHz filter can be installed.

• Initial condition

| Display | 8.83MHz | Display | 455kHz |
|------------|------------------------|---------|------------------------|
| No display | Through (LC filter) | 12kHz | L72-0315-05 |
| 6kHz | L71-0260-05 | 6kHz | L72-0319-05 |
| 2.4kHz* | Option (Not installed) | 2.4kHz | L72-0371-05 |
| 500Hz* | Option (Not installed) | 500Hz* | Option (Not installed) |

Frequencies marked * are not displayed by operating the filter changeover switch. They can be displayed by turning the filter switch on when an optional filter is installed.

• Optional filter types

| 8.83MHz | | 455kHz | |
|---------|----------|--------|-----------|
| 2.4kHz | YK-88S-1 | 500Hz | YG-455C-1 |
| 500Hz | YK-88C-1 | | |

Filters for bands other than those described above can be installed. In this case, the bandwidth displayed on the panel is not the same as the actual bandwidth.

| Item | Rating |
|----------------------------|--|
| Nominal center frequency | 73.05MHz |
| Passband width | $\pm 7.5\text{kHz}$ or more at 3dB |
| Attenuation bandwidth | $\pm 30\text{kHz}$ or less at 20dB |
| Ripple | 1.0dB or less |
| Insertion loss | 2.0dB or less |
| Guaranteed attenuation | 40dB or more at $f_0 - 910\text{kHz}$ (Spurious : 20dB or more at $f_0 \pm 1\text{MHz}$) |
| Center frequency deviation | Within $\pm 1.5\text{kHz}$ at 3dB |
| Terminating impedance | $2\text{k}\Omega \pm 10\%$ |

MCF (L71-0423-05) (RF unit X1)

| Item | Rating |
|------------------------------------|--|
| Nominal center frequency (f_0) | 8830kHz |
| Passband width | $\pm 3.0\text{kHz}$ or more at 3dB |
| Attenuation bandwidth | $f_0 \pm 12\text{kHz}$ or less at 18dB |
| Guaranteed attenuation | 30dB or more within $f_0 \pm 1\text{MHz}$ (Spurious : 10dB or more at $f_0 - f_0 + 500\text{kHz}$) |
| Ripple | 0.5dB or less |
| Insertion loss | 1.0dB or less |
| Terminating impedance | $2500\Omega/3\text{pF}$ |

MCF (L71-0260-05) (RF unit X2)

| Item | Rating |
|-------------------------------------|---|
| Nominal center frequency (f_0) | 8830kHz |
| 3dB attenuation bandwidth | $\pm 50\text{kHz}$ or more (from 8830kHz) |
| Guaranteed attenuation | 35dB or more at 9.285MHz (+455kHz) 45dB or more at 9.74MHz (+910kHz) |
| Ripple | 1.0dB or less |
| Insertion loss | 6dB or less |
| Input and output matching impedance | 330Ω |

Ceramic filter (L72-0351-05) (RF unit CF1)

| Item | Rating |
|-------------------------------------|--|
| Nominal center frequency | 455kHz |
| 6dB bandwidth | $\pm 6\text{kHz}$ or more (from 455kHz) |
| 50dB bandwidth | $\pm 12.5\text{kHz}$ or less (from 455kHz) |
| Ripple | 3dB or less (within $455 \pm 4\text{kHz}$) |
| Insertion loss | 6dB or less |
| Guaranteed attenuation | 35dB or more (within $455 \pm 100\text{kHz}$) |
| Input and output matching impedance | $2.0\text{k}\Omega$ |

Ceramic filter (L72-0315-05) (IF unit CF1)

| Item | Rating |
|-------------------------------------|--|
| Nominal center frequency | 455kHz |
| 6dB bandwidth | $\pm 3\text{kHz}$ (from 455kHz) |
| 50dB bandwidth | $\pm 9\text{kHz}$ (from 455kHz) |
| Ripple | 2dB or less (within $455 \pm 2\text{kHz}$) |
| Insertion loss | 6dB or less |
| Guaranteed attenuation | 60dB or more (within $455 \pm 100\text{kHz}$) |
| Input and output matching impedance | $2.0\text{k}\Omega$ |

Ceramic filter (L72-0319-05) (IF unit CF2)

| Item | Rating |
|-------------------------------------|-------------------------------------|
| Center frequency | $455 \pm 0.20\text{kHz}$ |
| 6dB bandwidth | $\pm 1.2 \sim \pm 1.4\text{kHz}$ |
| 60dB bandwidth | 4.5kHz or less |
| Guaranteed attenuation | 60dB or more at $\pm 100\text{kHz}$ |
| Spurious | 40dB or more at 600~750kHz |
| 6dB band ripple | 2dB or less |
| Insertion loss | 6dB or less |
| Input and output matching impedance | $2.0\text{k}\Omega$ |

Ceramic filter (L72-0371-05) (IF unit CF3)

CIRCUIT DESCRIPTION

Transmitter Circuit Configuration

The audio signal from the microphone is input to CN6 of the IF unit. The signal is split and directed to the base of VOX amplifier transistor Q73 and microphone amplifier IC15. The signal input to IC15 is amplified by about 20dB. The signal from the data communication input/output pin (rear PACKET) is also input to IC15. The signal output from IC5 is split and directed to the microphone amplifier output for the optional DSP-100, the FM microphone amplifier, and the SSB, AM microphone gain potentiometer.

In SSB and AM modes, the signal passing through the microphone gain potentiometer is amplified by Q43 (2SC3722K), and input to balanced modulator IC8 (AN612). In AM mode only, the AM signal is generated by breaking the balance of IC8. Q43 does not operate in FM, CW, and FSK modes because the emitter voltage is applied via diodes D39 and D40. The 455kHz DSB signal from IC8 passes through transmission switching diodes D12, D11, and D2, and through filter switching diodes D6 and D5 (SSB), or D4 and D3 (AM) to produce the 455kHz SSB and AM signals. These signals are input to CN6 (TIF) of the RF unit from W1 (TIF).

The 8.375MHz LO3 signal from the CAR unit is input to pin LO3 of CN7 of the RF unit, and goes to first transmit mixer IC5 (AN612). The TIF signal goes to IC5, and is mixed with the LO3 signal to produce the 8.83-MHz signal. The output from IC5 passes through ceramic filter CF1 and transmission switching diodes D50 and D45. In modes other than FM, the signal passes through filter switching diodes D47, D5 x 2 (MCF : 6k), D6 and D42. In FM mode, the signal passes through D46, D41, and D40. The filtered signal is automatic-level-controlled and keyed by Q48.

The 64.22MHz LO2 signal from the PLL unit is input to pin LO2 of RF unit CN11, passes through transmission switching diode D59, and is mixed with the 8.83MHz signal by second mixer Q45 and Q46 to produce a 73.05MHz signal. The LO1 signal (VCO) from the PLL unit is input to the LO1 pin of RF unit CN10, amplified by Q24, passes through transmission switching diode D37, and is mixed with the 73.05MHz signal by third mixer Q20 and Q21 to produce the desired signal. The signal is input to Q19, and its gain controlled. The resulting signal is amplified by Q18 (2SC2954) to produce a drive output, which goes to the final unit from CN9.

The signal is amplified to the power for each type by the final unit, harmonics are attenuated by the filter unit, and the resulting signal is output from the antenna connector. In FM mode, the output from IC15 of the IF unit passes through FM microphone module Z7 (X59-3000-03) of the emphasis IDC circuit, is output from CN3 (FMM), and is input to CN5 of the PLL unit to modulate LO2 (64.22MHz).

The carrier for CW, FM, and FSK is adjusted to the correct level by changing the current through pin diode D36 (M1204) of the IF unit with the carrier potentiometer. The carrier passes through switching diodes D35 and D34, and is input to RF unit CN6 (TIF) from W1 (TIF). The signal follows the same route as for SSB, and is radiated from the antenna.

CW keying is performed by the ALC voltage of the second gate of Q48 of the RF unit and the CKY signal of the drain.

CIRCUIT DESCRIPTION

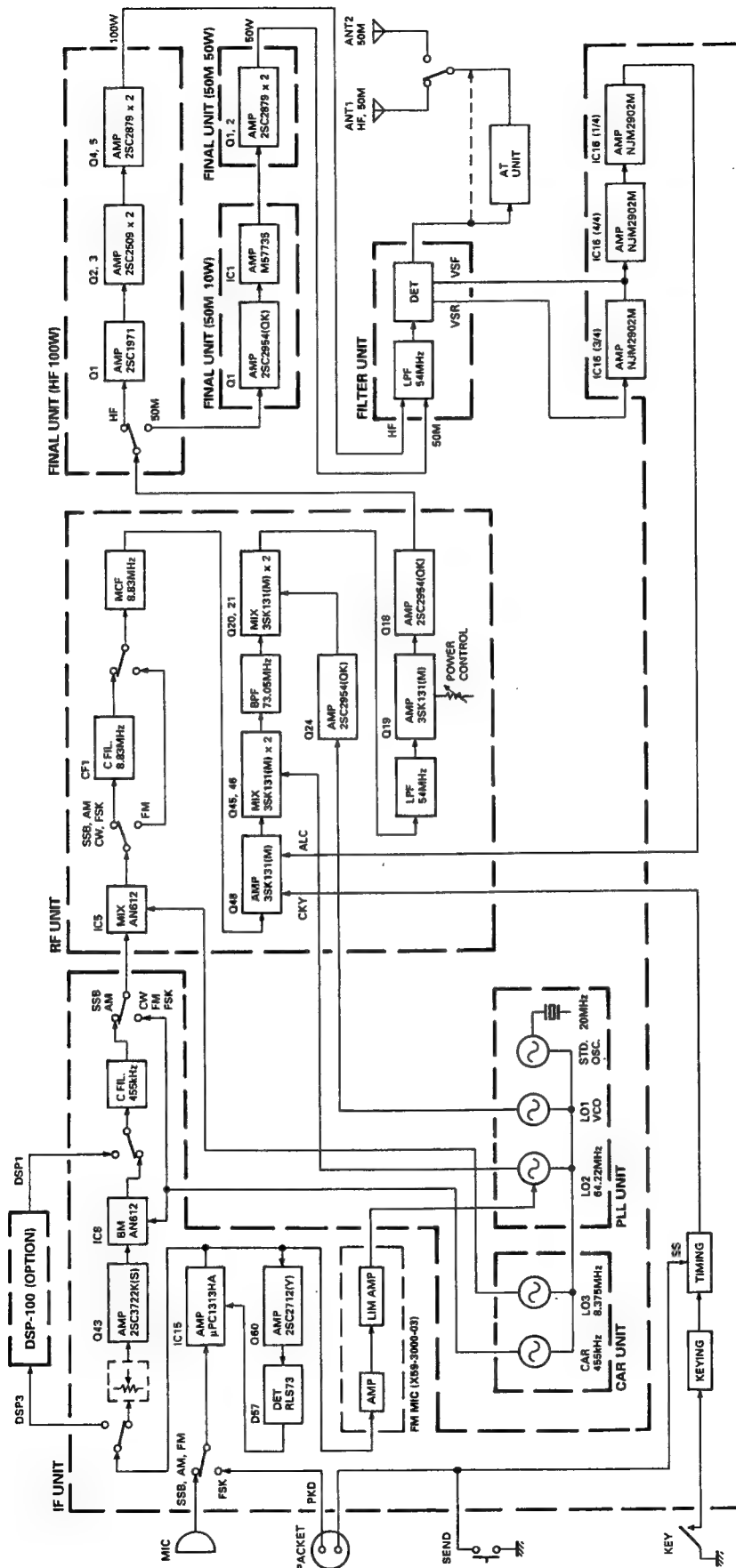


Fig. 13 Transmitter block diagram

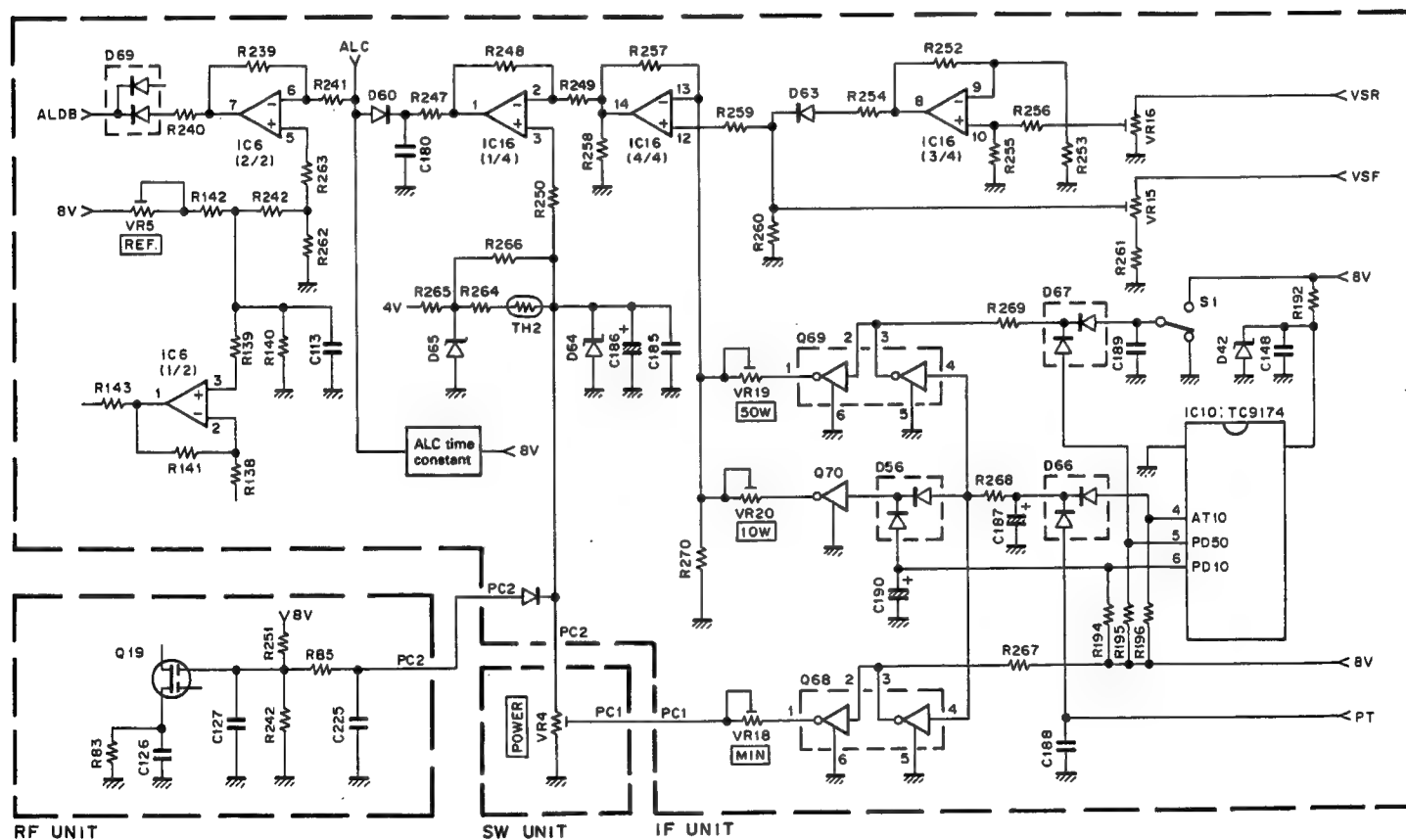
CIRCUIT DESCRIPTION

1) ALC circuit

The ALC circuit of the TS-690S/450S is based on that of the TS-680S, so its operations are almost the same.

IC16 (1/4) controls the ALC and power. The output from IC16 (4/4) goes to the - pin (pin 2) of IC16 (1/4), and this output and the power control voltage applied to the + pin (pin 3) control the differential amplifier. If there is a transmission output, the voltage at the - pin (pin 2) of IC16 increases, and the output from IC16 (1/4) decreases. If this output falls below the ALC voltage (about 2.5V), the ALC takes effect. The power is controlled by changing the voltage at the + pin (pin 1) of IC16 (1/4). The minimum power is set by VR18 of the IF unit.

The power control voltage (PCV) changes with the power supply voltage and temperature. When the power supply voltage increases, the PCV is limited by zener diodes D65 (RLZ13B) and D64 (RLZ3.6B) to prevent overpower. If the power supply voltage drops, the power is decreased. If the temperature rises, the resistance of thermistor TH2 decreases, and the PCV increases, but overpower is prevented by the temperature characteristics (negative) of the zener diodes. If the temperature decreases, the PCV is decreased by the thermistor to decrease the power. The PCV controls the second gate of Q19 of the RF unit and the drive level.



CIRCUIT DESCRIPTION

2) Power control circuit and power settings

The power needs to be set to 100W, 50W for AT-TUNE (TS-450S only) mobile operation, and 50W for the 28MHz band. The power is set by presetting the gain of non-reversing amplifier IC16 (4/4).

The presetting for a 100W model is determined by the fixed resistance of R270 and R257.

For 50W, 28MHz-band and 50W, 50MHz-band (TS-690S only) mobile operation, the signal at PD50 (pin 5) of IC10 (TC9174F) of the IF unit or S1 is turned on by a signal from the microcomputer, and pin 2 (base) of Q69 is made high. Thus, VR19 (50W) is connected to R270 in parallel, and the gain of IC16 (4/4) is increased.

In AT-TUNE operation (for the TS-450S only), the signal from AT10 (pin 4) of IC10 is made high by a signal from the microprocessor, pin 4 (base) of Q68 and pin 4 (base) of Q69 are turned on, and VR18 and VR19 are disconnected. Q70 is turned on, VR20 and R270 are connected in parallel, and the gain is determined to keep the power at 10W regardless of the position of power control potentiometer (SW unit D/5) VR4.

3) VSWR protection circuit

If the VSWR of the antenna is low, or if there is a large reflected wave during operation of the auto antenna tuner, it is detected by the filter unit, the signal is input to the VSR of IF unit CN8, is amplified by IC16 (3/4), and the ALC voltage is decreased to protect against the VSWR.

4) Temperature protection circuit

The temperature protection circuit operates, about 10V is applied to PT of IF unit CN5, and the power is reduced to 10W, as with AT-TUNE.

5) ALC meter circuit and adjustment

The reference voltage of the ALC meter circuit is generated by dividing the reference voltage of the signal-strength meter with resistors. The reference voltage is applied to the + pin (pin 5) of reversing amplifier IC6 (2/2) of the IF unit, and the ALC voltage is applied to the - pin (pin 6). The output signal from pin 7 is input to the digital unit as the ALDB signal, is operated on, and drives the meter. The meter is adjusted by matching two points, the maximum ALC zone and full scale, in adjustment mode 13 with respect to the beginning of ALC.

Standby Control Timing

Standby control and timing are handled by the IF unit (X48-3090-XX). The following control signals are used:

- SS : Standby switch. Active low.
- KEY : Keying signal from the keyer. Active low.
- TXI : Transmission inhibit signal from the microprocessor. Low when transmission is inhibited.
- PKS : Standby signal from the data communication terminal. Active low.

The control output signals are as follows:

- TXB : 8V during transmission
- RXB : 8V during reception. Reversal of TXB.
- CKY : Keying output signal. Active high.
- RBC : Receive control signal. Active low.

1) Manual standby (except CW)

• Reception → Transmission

When the standby switch is pressed and the SS line is grounded, Q52 is turned on. If pin 12 (TXI) of IC11 is high and transmission is possible, analog switch IC11 (4/4) is turned on. The signal is input to pin 8 of the BK-IN module (X59-3930-00), passes through D3 in the module, is input to pin 2 of the TRX module (X59-3680-01) from pin 3 of the module via R205, passes through the internal switch circuit, and TXB is output from pin 5. When TXB is high, RXB is low.

CIRCUIT DESCRIPTION

• CKY generation

Since CWB (8V in CW mode) is 0V in any mode other than CW, Q51 is turned off, pin 6 of IC11 goes high, and IC11 (3/4) is turned on. The signal passes through D46, and if pin 13 (TXI) is high and transmission is possible, the signal passes through D45, R200, and pin 6 of the BK-IN module (X59-3870-00), and is input to pin 2 of IC3 in the module.

The high output signal from pin 1 of IC11 is input to pin 5 of the delay module (X59-3860-00), and pin 12 of the IC1 one-shot multi in the module goes high. The \bar{Q} output from pin 9 of IC1 is low for 12.5ms, then goes high. The \bar{Q} output is input to pin 1 of IC3 in the module via pin 4 of the delay module and pin 5 of the BK-IN module. Pin 4 of IC3 goes low 12.5ms after the standby switch is pressed. The signal is input to pin 13 of inverter IC1 (e/6), is inverted by the inverter, output from pin 12, and output from pin 7 of the BK-IN module as the CKY signal.

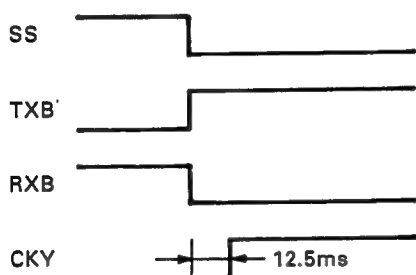


Fig. 15 CKY generation

• Transmission → Reception

When the standby switch is turned off, Q52 is turned off, and pin 8 of the BK-IN module goes low. Because of the time constant circuit consisting of R1 and C1 between pin 10 of IC1 (a/6) and pin 9 of IC1 (b/6), IC1 b/6 goes low 5ms after the standby switch is turned off. Pin 2 of the TRX module goes low via pin diode D3 in the module, pin 3 of the module, and R205. So, TXB goes low 5ms after the standby switch is turned off, and RXB goes high.

• CKY down

When the standby switch is turned off, pin 1 of IC11 goes low and pin 6 of the BK-IN module goes low. So CKY goes low when the standby switch is turned off.

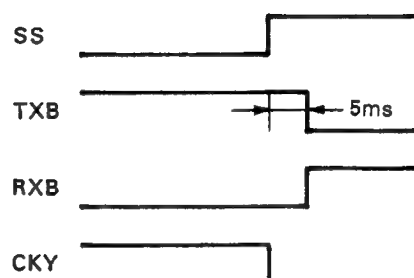


Fig. 16 CKY down

• RBC generation

When pin 3 of the BK-IN module goes low, pin 3 of IC1 (c/6) and pin 1 of IC1 (d/6) in the module go low. Because of the time constant circuit consisting of R3 and C3, the output from pin 4 of IC2 goes low 35ms after the standby switch is turned off, producing the RBC signal.

The RBC signal is applied to the base of the switching transistor Q1 of the IF unit, which grounds the 455kHz receive IF signal.

• PLL, DDS data and transmit/receive timing signal

It takes 12.5ms from the standby switch being grounded until CKY is generated. It takes 20ms from RXB going high until RBC goes low. The PLL and DDS data from the microprocessor are switched, and the diode switch and analog switch are switched during that time to assure stable transmission and reception.

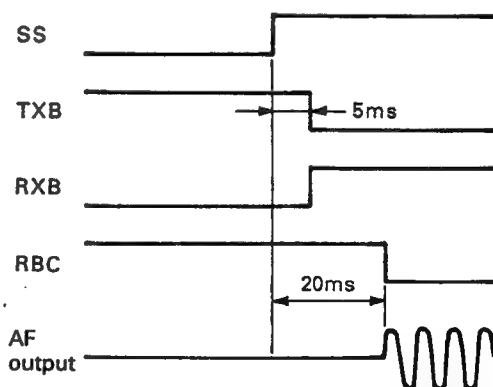


Fig. 17 PLL, DDS data and transmit/receive timing signal

CIRCUIT DESCRIPTION

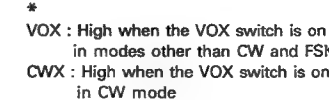


Fig. 18 Standby timing circuit

There is no page 24, as the schematic on page 23 is 2 pages large.

CIRCUIT DESCRIPTION

2) Full break-in operation timing**• TXB generation by key down**

When a key is plugged into the jack, and the key pressed, Q56 is turned on, and the signal passes through D52. Since the VOX switch is also turned on during full break-in, pin 11 of IC10 goes high, the signal passes through D50, pin 12 of IC12 (3/4) goes high, and the ON signal is input to pin 3 of the delay module. The signal is split and sent to D3 in the module and pin 4 of IC1. Since the delay VR on the front panel is turned fully counterclockwise, the time constant generated by one-shot multi IC1 is very small. The signal goes via D3 and is input to pin 2 of the module, Q53 turns on, the SS line goes low, and Q53 turns on.

If the TXI signal is high, the high signal passes through IC11 (4/4), is input to enters pin 8 of the BK-IN module, and is output from pin 3, as in manual standby. Pin 2 of the module goes high, and TXB is generated.

• CKY generation

When a key is plugged into the jack, the switch in the jack is closed, Q51 turns on, pin 6 of IC11 (3/4) goes low, and pin 5 of IC11 (2/4) goes high.

When the key is pressed, the collector of Q56 goes high, and the signal passes through D52, IC12 (3/4), IC11 (2/4), D46, and IC11 (1/4). A high signal is input to pin 6 of the BK-IN module through D45 and R200. The CKY signal rises 12.5ms after the key is pressed, in the same way as for CKY generation at manual standby.

• Key up

When the key is up, pin 8 of the BK-IN module goes low, and pin 2 also goes low. TXB goes low, and RXB goes high. One difference from manual standby, except for CW, is that since, in CW mode, Q1 in the module is turned on through pin 10 of the BK-IN module (comprising R211 and D48) from CWB, C2 is connected to C1 in parallel, and the TXB delay time when the key is up is 12.5ms.

For the output signal from IC11 (1/4) for producing the CKY signal, there is a switch circuit consisting of C149 and Q48 between D45 and R200. In CW mode, Q74 is turned on, and C230 enters the output side of R317 to produce the delay time for key up. The time constant generated by the CR circuit provides a correction of about 13ms when the key is up by raising the CKY waveform 12.5ms after the key is down to prevent deterioration of the waveform.

• RXB and RBC generation

TXB goes low, and RXB goes high, 12.5ms after the key is up. RBC operates the receive signal line with a delay of 50ms in the same way as for the manual standby.

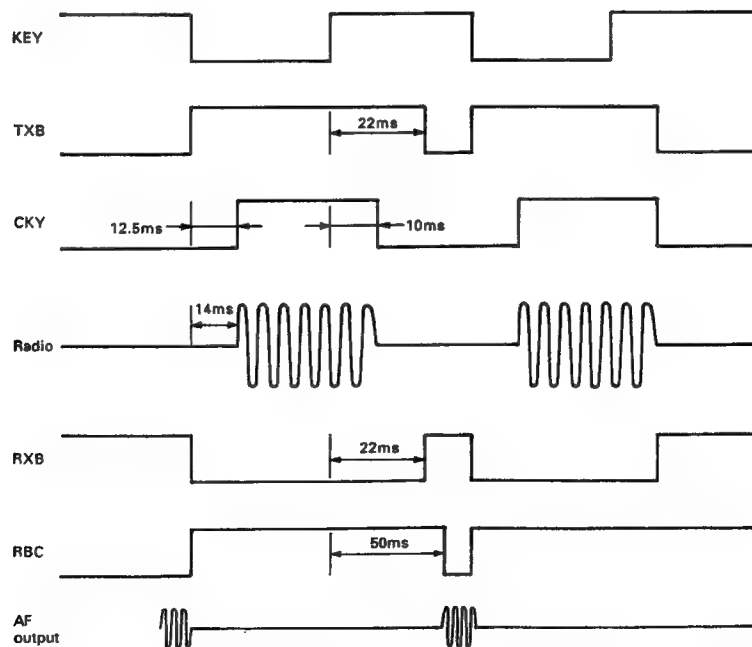


Fig. 19

CIRCUIT DESCRIPTION

3) Timing for semi-break-in operation

• TXB generation by key down

When the key is down, the signal follows the same route as for full break-in. The high signal input to pin 3 of the delay module makes pin 4 of one-shot multi IC1 in the module high, and a high signal is output from pin 6 for a certain time. The time is determined by analog switch IC12 (1/4) in CW mode, so the one-shot multi IC of the delay module is controlled by chemical capacitor C156 in the IF unit and the time-constant circuit of delay VR and R218 in the front panel.

• CKY generation

The CKY signal rises after a delay of 12.5ms in the same way as for full break-in; after the key is up, it rises after a delay of 13ms.

4) Timing during VOX operation

The audio signal from the microphone is input to pin 4 of CN6 of the IF unit, and is amplified by Q73. The gain is controlled by the VOX VR (VR24), and the resulting signal goes to pin 9 of the VOX module (X59-1080-00). The output from pins 1 and 2 turns Q55 on. If the VOX switch is pressed, analog switch IC12 (2/4) turns on, and a high signal goes to pin 3 of the delay module. The high signal with time constant turns Q53 on, and grounds the SS line. Subsequent operations are the same as for manual standby.

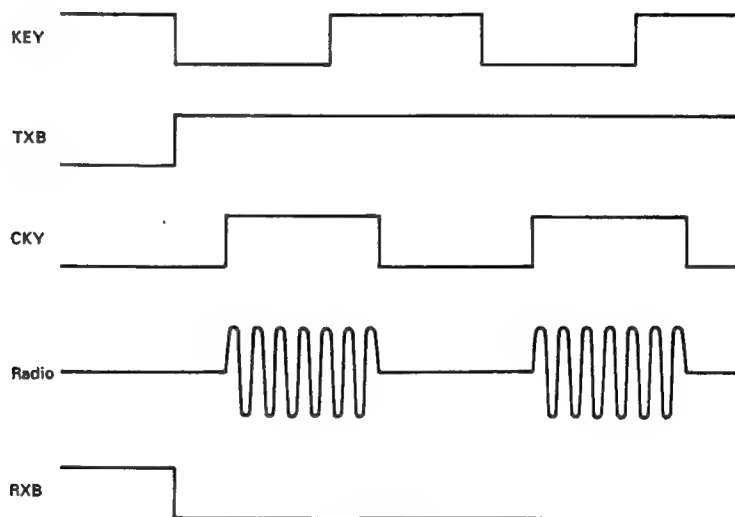


Fig. 20

50MHz 50W Final Unit

This unit comprises a power amplifier circuit that amplifies the 50MHz band signal, a bias circuit that provides bias to that circuit, and a fan control circuit that drives the cooling fan motor.

The power amplifier circuit is a class AB push-pull circuit, and amplifies the signal input from the 50MHz 50W final unit to up to about 80W. Since final transistors Q1 and Q2 are 2SC2879 types for the HF band, the 54MHz gain is low compared with the 50MHz, but it is corrected by C3 and C4. If the values of C3 and C4 are too small, the power decreases, and if they are too large, oscillation tends to occur at 30MHz. The core material of the input and output transformers is 6B2 with a low μ so that the impedance is converted with little loss.

Q3 provides the bias current for final transistors Q1 and Q2. The bias circuit around Q3 is the same as that used for the TS-680, and the bias current is adjusted by VR1.

The fan control circuit operates as follows. If transmission command signal CN2 50T goes high (about 8V), Q4 turns on, about 7V is applied to the cooling fan motor, and the motor runs. If the radiator temperature exceeds about 50°C, the fan module turns on, about 9V is applied to the cooling fan motor, and the motor runs faster. The fan keeps running until the radiator temperature falls, even if receive mode is entered. If the radiator temperature exceeds about 90°C due to continuous transmission, CN2 50PT goes high (about 10V), and the ALC reduces the transmission power to about 10W.

CIRCUIT DESCRIPTION

AT Unit

1) Auto Antenna Tuner

When the AUTO/THRU switch is set to AUTO, ATA goes high, AUTO/THRU switching relay K1 closes, and the AT is inserted to prepare for tuning. If variable capacitors VC101 and VC102 are not at their preset positions, they are set to these positions, and AT TUNE operation and actual transmission start after the pre-setting ends.

When AT TUNE is turned on, the CW mode is entered, and the transmission output becomes about 10W. If the VSWR is less than 1.2, tuning is regarded as complete, and the AT TUNE operation stops. If the VSWR is greater than 1.2, the duty cycle of the motor control pulse (described later) is controlled according to the VSWR.

The motor speed is determined by the microprocessor, and the direction is determined by the phase comparator (IC1) and amplitude comparator (IC6) if the APRE is low, and by the microprocessor if the APRE is high.

• Auto tuning mode

The transmitter power from the final unit passes via the filter unit through current/voltage detection transformers L1 and L2, which have toroidal cores. The current and voltage components detected here are rectified by a waveform rectification circuit consisting of D4, Q1, D7, and Q2, and are then phase-compared by IC1 (SN74S74NS). The output signals (\bar{Q} and Q) from pins 8 and 9 of IC1 passes from IC2 (TC4066BF) through the switch, and are applied to the motor drive IC, IC4 (BA6109U2). Variable capacitor VC101 is turned by motor M1 so that the phase difference of the voltage and current components decreases.

The voltage and current components detected by L1 and L2 are rectified by germanium diodes D1 and D2 (1N60), and are applied to voltage comparison circuit IC6 (NJM2903M) as the amplitude component of the signal. The comparator output passes from IC3 (TC4066BF) through the switch. Motor M2 is driven by another motor drive IC, IC5 (BA6109U2), which turns variable capacitor VC102 in the direction that decreases the amplitude difference of the voltage and current components.

Thus, variable capacitor VC101 adjusts the capacitance of the circuit so that the current and voltage phases match, and variable capacitor VC102 adjusts the resistance of the circuit so that the current and voltage amplitude difference decreases. If the phases match and the amplitude difference is zero, the SWR is 1 : 1.

The speed of motors M1 and M2 is determined by the duty cycle of the pulse input to pin 8 of IC4 and IC5. It is controlled according to the VSWR calculated by the CPU in the digital unit and the speed corresponding to preset or manual antenna tuning.

Pulse signal SPED from the digital unit passes through Q5 (DTC114EK), and is amplified by Q4 (2SA1204) to produce a control pulse input to IC4 and IC5.

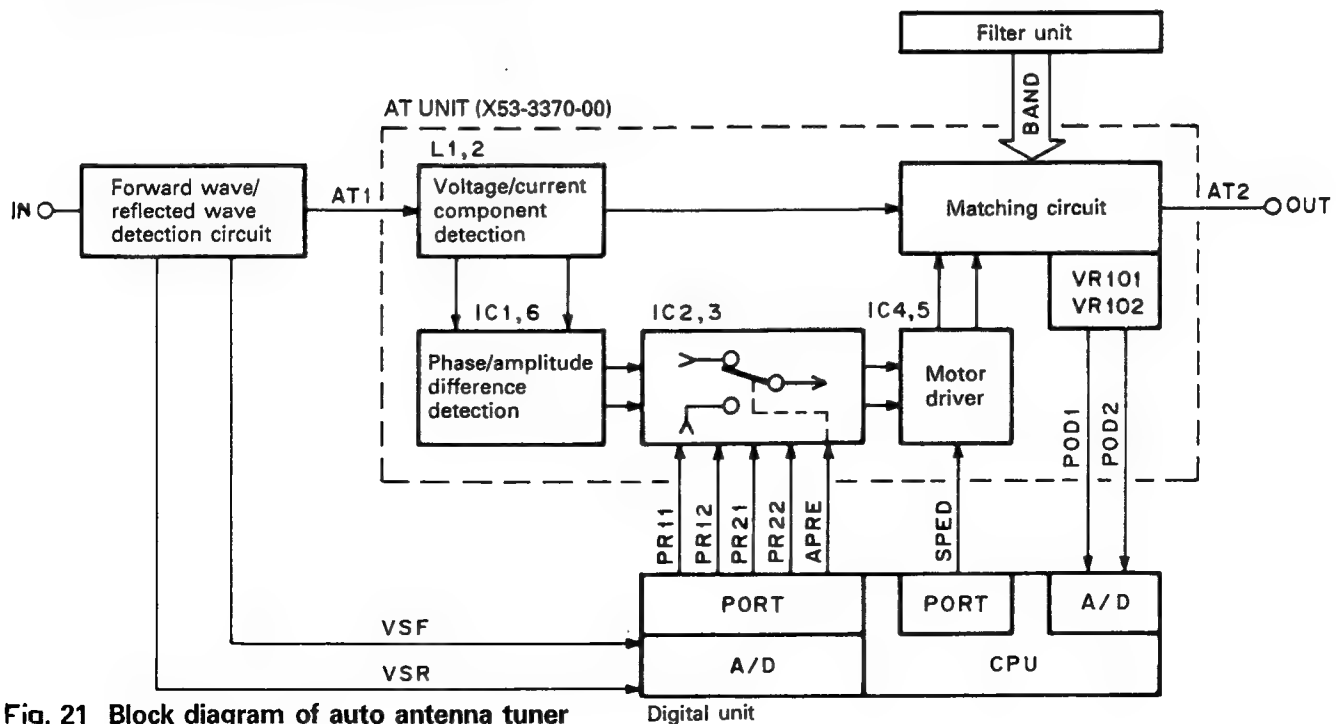


Fig. 21 Block diagram of auto antenna tuner

Digital unit

CIRCUIT DESCRIPTION

With this control, when the SWR is 3 : 1 or more, the motor runs fast since the duty cycle of the motor drive voltage pulse is 100%. When the SWR is 2 : 1, the duty cycle becomes about 50%, and the motor runs slowly.

The matching circuit is a T type. The tap position from 3.5 to 30MHz is controlled by six relays, K101 to K106.

Position detection potentiometers VR101 and VR102 are linked to the spindles of variable capacitors VC101 and VC102 with a gear ratio of 1 : 1. Voltages of 0 to 5V (POD1 and POD2) are produced according to the positions of the variable capacitors. This position data is input to the CPU through the A/D converter by the digital unit, and is used as the reference voltage in the feedback control system, which is used for preset antenna tuning and manual antenna tuning. The same signal is also used for preset data and to signal the completion of antenna tuning.

The potentiometers used here are not ones that rotate through 360 degrees. Since the TS-450S limits the rotation angle of each potentiometer, the rotation range is from the minimum capacitance to the maximum capacitance, plus a little extra for headroom.

Through this control, like preset antenna tuning, which will be described later, POD1 and POD2 are monitored by the microprocessor. If the lower limit voltage of 0.6V or the upper limit voltage of 4.2V is reached, the microprocessor recognizes that a variable capacitor is close to one of its limits. To return the voltage to the opposite side, APRE is switched high. For VC101, if the voltage is close to the lower limit with respect to PRE1, the voltage near the upper limit is output. If the voltage is close to the upper limit with respect to PRE1, the voltage near the lower limit is output.

The other variable capacitor, VC102, should be fixed. If the variable capacitor voltage exceeds the specified limit, the variable capacitor is returned to the opposite limit. The other variable capacitor remains in the same position.

The motor direction is determined by the CPU, unless auto antenna tuning is performed with high APRE. The logic of PR11 to PR22 is the same as that of IC4 and IC5. The signal output from the digital unit passes through IC2 and IC3, and is input to IC4 and IC5.

• Manual antenna tuning

Hold down the M.IN key and switch the power on. Select menu number 31 with the click encoder, turn the display off with the DOWN key, and press the CLR key to return to the normal mode. The transceiver is now ready for manual antenna tuning.

The main encoder controls VC101, and the sub-encoder controls VC102.

• Preset antenna tuning

When auto or manual antenna tuning ends, the position of the variable capacitors is stored in memory by the microprocessor as preset data for that band.

When the band is changed back after tuning is done in another band, APRE goes high, the motors are controlled by the microprocessor, and preset antenna tuning takes place. During preset antenna tuning, auto antenna tuning and transmission are inhibited even if the AT TUNE switch is pressed or the transceiver is ready to transmit.

The initial preset data when the microprocessor is reset includes standard data for a 50Ω load on each band.

| | | PR11 | PR12 | PR21 | PR22 |
|---------|------------------|------|------|------|------|
| Motor 1 | Normal rotation | H | L | — | — |
| | Reverse rotation | L | H | — | — |
| Motor 2 | Normal rotation | — | — | H | L |
| | Reverse rotation | — | — | L | H |

CIRCUIT DESCRIPTION

Digital Control Unit

1) Digital control

The TS-690S/450S digital control circuit has a multiple chip configuration, and comprises a CPU (μ PD 78213GJ), a 32K ROM, an 8K RAM, two I/O expanders, and an EEPROM. This circuit controls all the units.

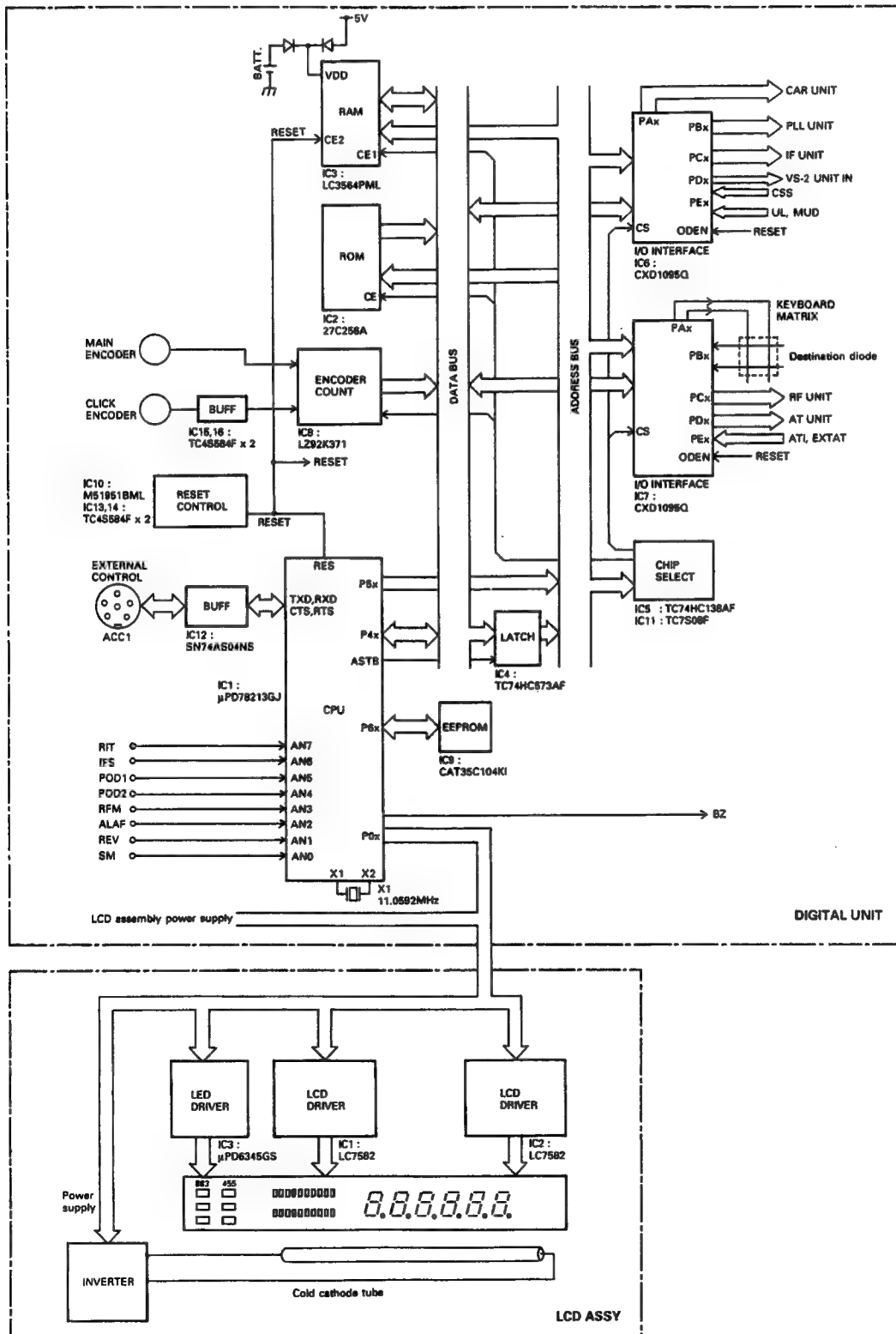


Fig. 22 Digital control block diagram

CIRCUIT DESCRIPTION

2) Address control and memory map

AD0 to AD7 of the CPU are multiplexed low-order address and data bus lines, and A8 to A15 are the high-order address lines. The multiplexed low-order address signals are separated from the data signals by IC4 (74HC573A) and the ASTB signal. The high-order address signals of A12 to A15 are converted to a chip select signal for each IC by IC5 (74HC138A) to access each port.

| | |
|--------|-------------|
| 0000H | Program ROM |
| 8000H | I/O-1 |
| 9000H | I/O-2 |
| 0A000H | Encoder IC |
| 0B000H | Unused |
| 0C000H | Unused |
| 0D000H | RAM |
| 0E000H | RAM |
| 0F000H | CPU-RAM |
| 0FFFFH | |

Fig. 24 Memory map

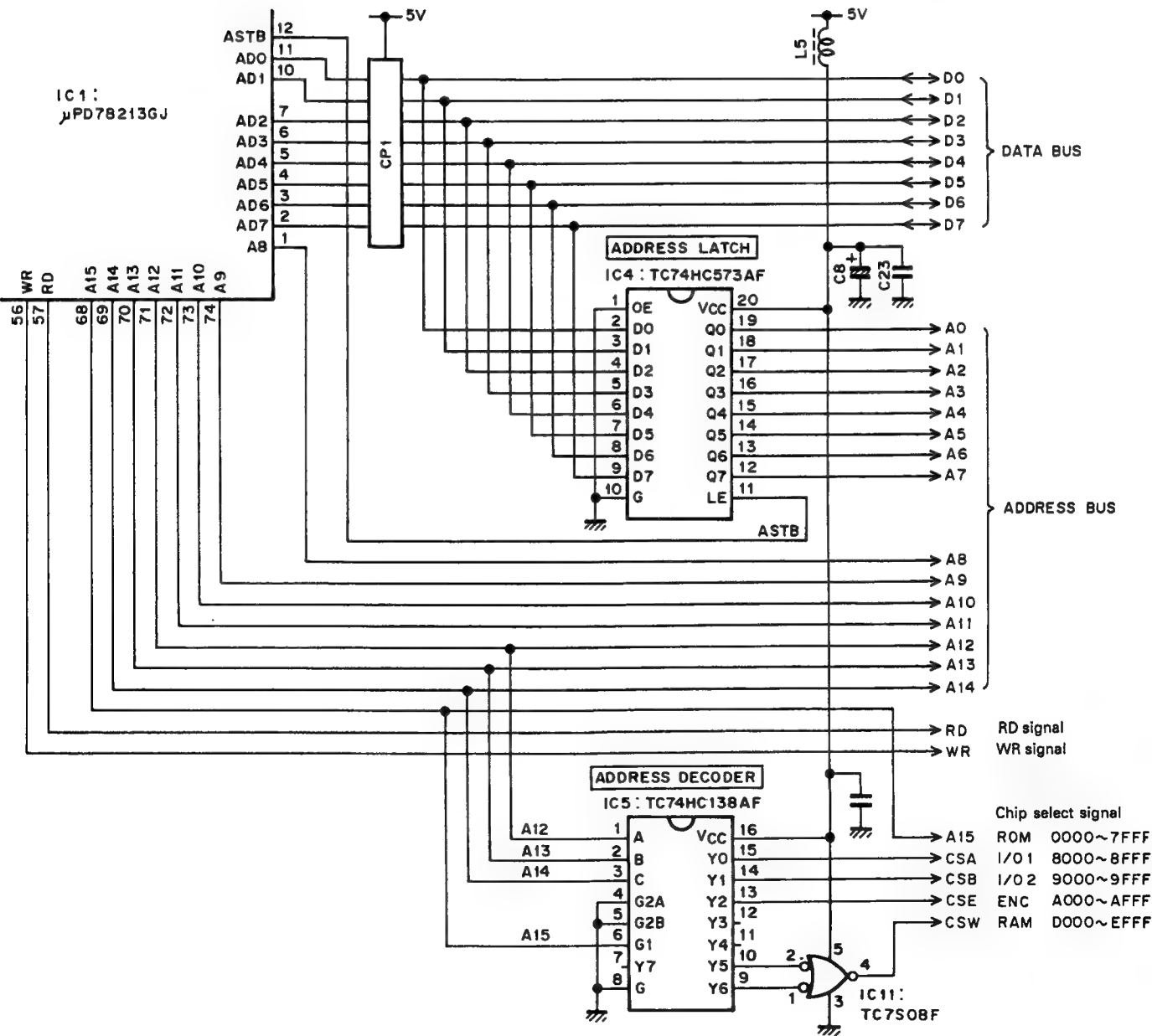


Fig. 23 Address separation circuit

CIRCUIT DESCRIPTION

3) Reset circuit

The power supply voltage (5V line) is always monitored by IC10 (M51951BML) to prevent destruction of memory data by the power being switched off or by momentary power failure. If the 5V line voltage is low, the IC stops the CPU immediately, inhibits writing to

memory (RAM), and backs up the RAM with a battery. When the power supply voltage becomes normal, the CPU and I/O are initialized after the time constant set by R1 and C13, and operation resumes.

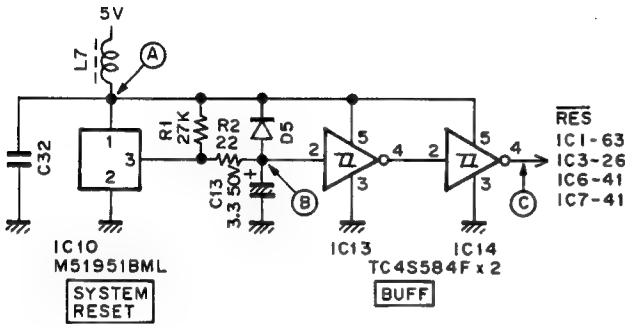


Fig. 25 Reset circuit

4) Encoder circuit

The rotation pulses from the main magnetic encoder and the click encoder are input to IC8 (LZ92K371), and read by the CPU via the data bus. IC8 multiplies the main encoder rotation pulse by four, and outputs the resulting signal and rotational direction; it multiplies the click encoder rotation pulse by two, and outputs the resulting subencoder signal and rotational direction. IC15 and IC16 (TC4S584F) rectify the waveform of the click encoder pulses.

5) Display Circuit

The TS-690S/450S uses a transmission-type display with a negative LCD and a cold cathode tube. The LCD is driven by the LCD driver (LC7582 x 2) with a duty cycle of 1/2. The IF filter display is a yellow LED, and is driven by the LED driver (μ PD6345GS). Display data is input to the three drive ICs as serial data, serial clock, and enable signals.

6) PLL and DDS control circuit

The TS-690S/450S has two PLLs and two DDSs. The main CPU outputs serial frequency data to the PLLs and DDSs according to the displayed frequency. Two PLL ICs output unlock data signals. If one of the PLLs should unlock, the display indicates that the PLL is unlocked.

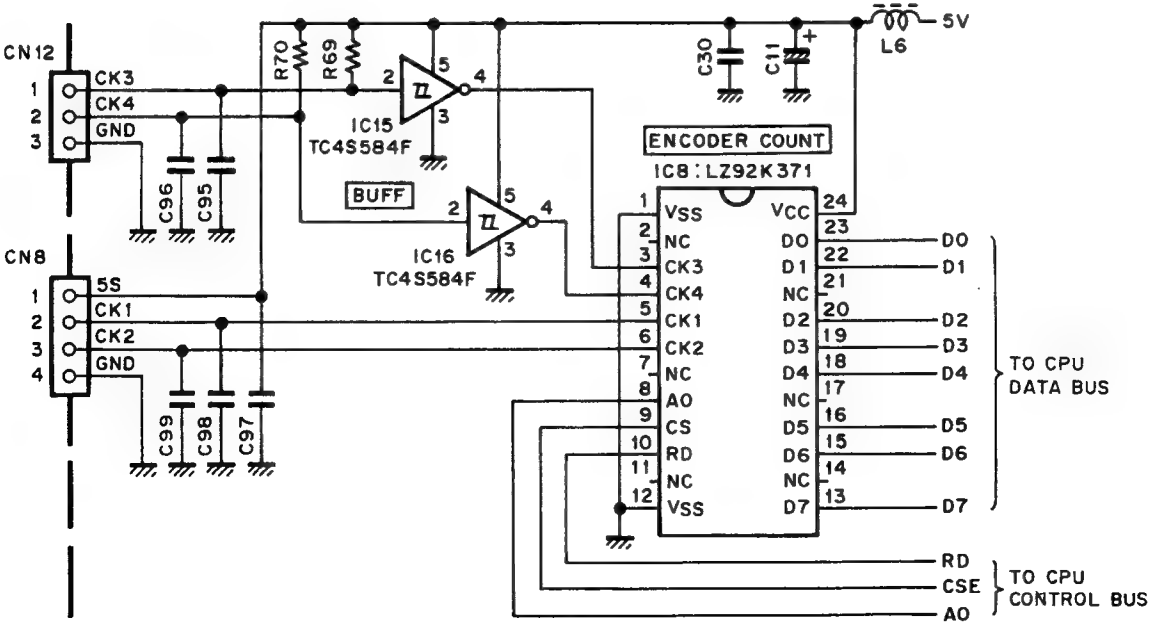
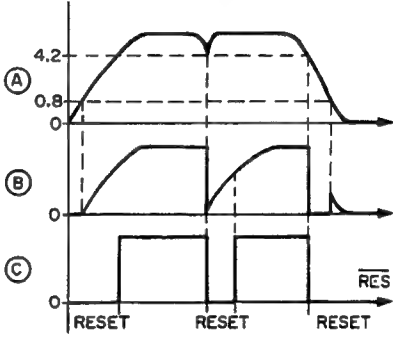


Fig. 26 Encoder circuit

CIRCUIT DESCRIPTION

7) IF unit control signal

The CPU outputs the mode signal, 455kHz IF filter select signal, and power-down signal to the IF unit, and receives the signal from each meter, standby switch signal to display data on the meter and perform transmission. The signal is output from the CPU via a serial-to-parallel converter (TC9174F) and a ribbon cable for easy connection.

8) RF unit control signal

The receive BPF select signal, transmit LPF select signal, and 8.83MHz IF filter select signal are input to the RF unit as serial data. The AT-300 control signal and blanking signal are output from the RF unit.

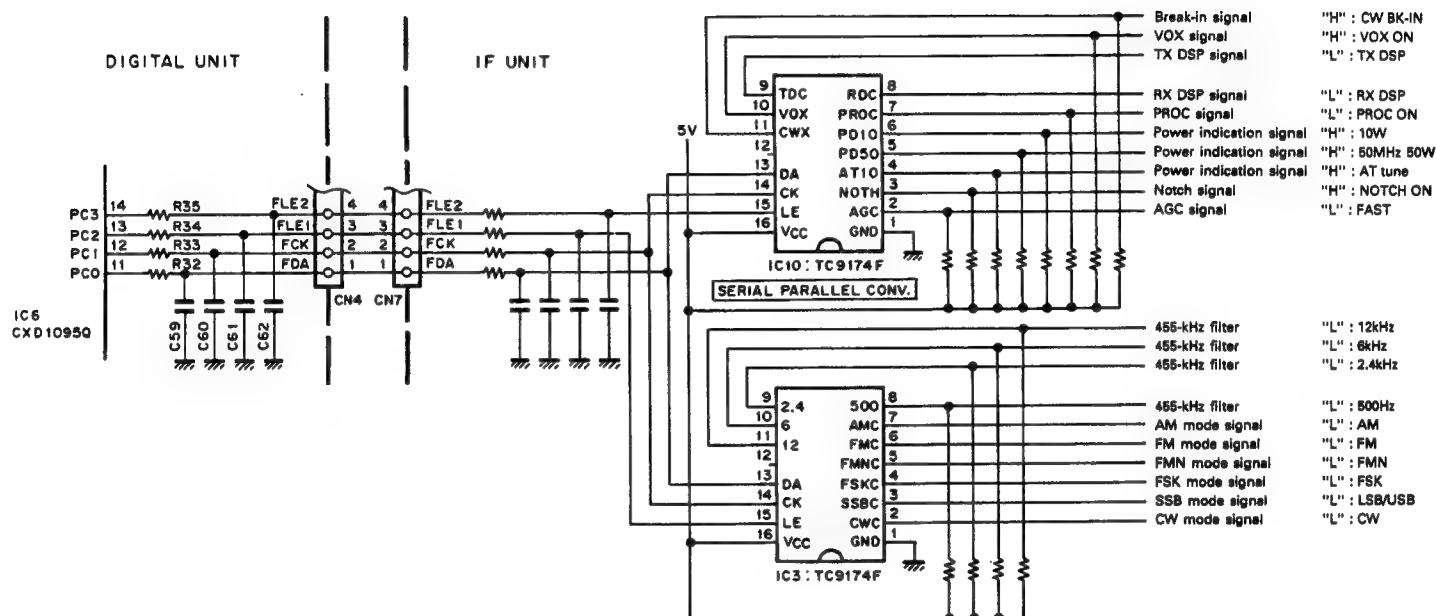


Fig. 27 IF unit serial-to-parallel converter

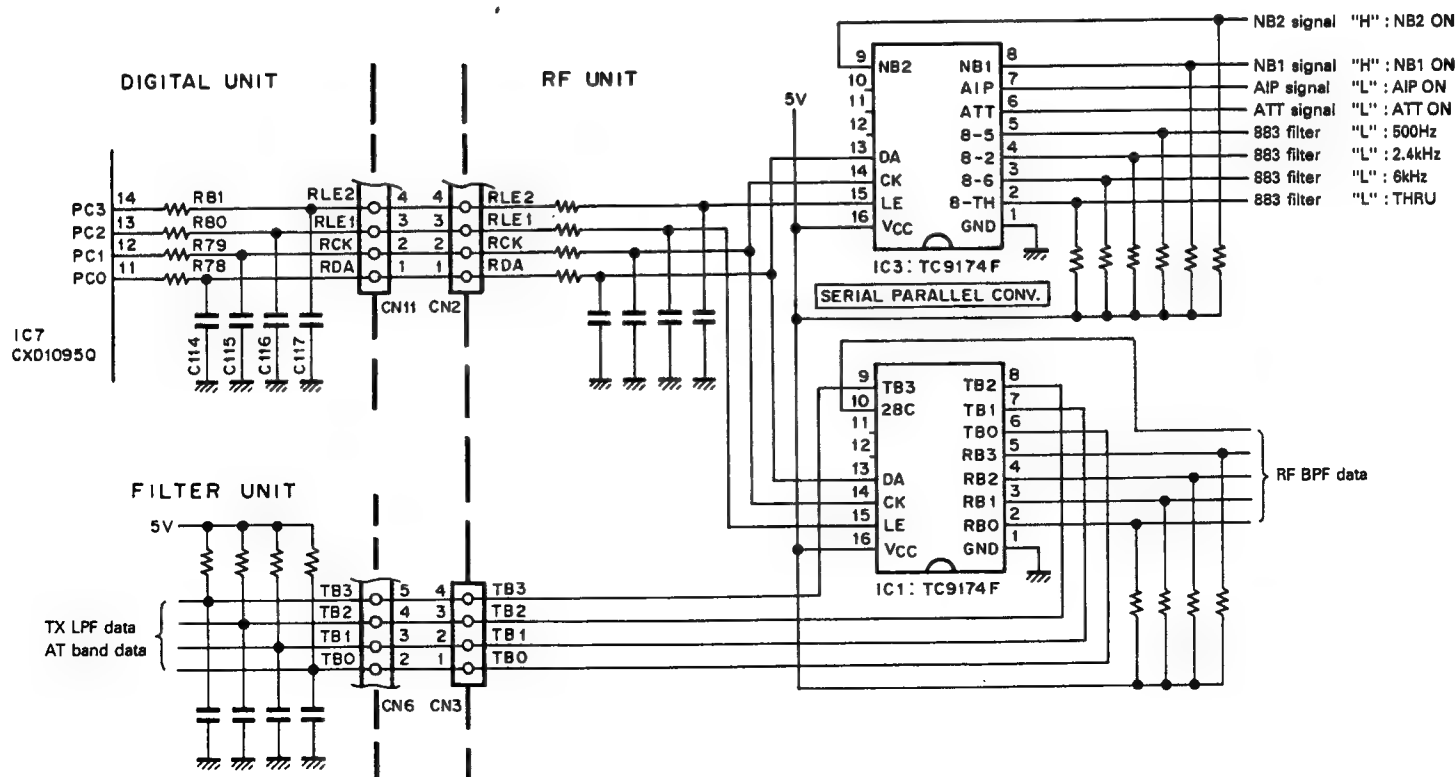


Fig. 28 RF unit serial-to-parallel converter

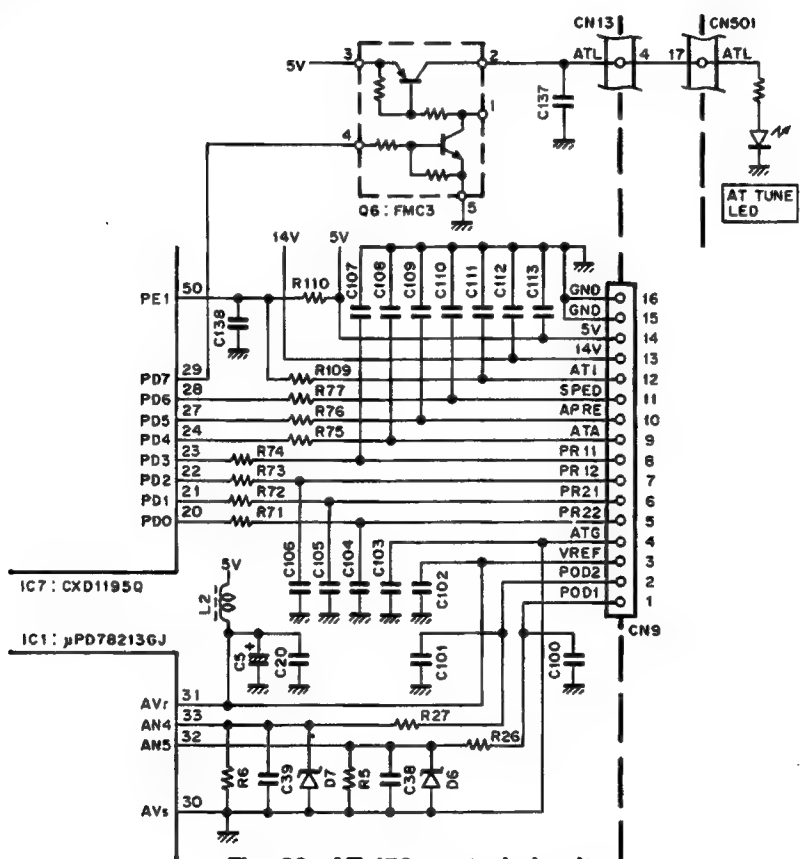
CIRCUIT DESCRIPTION

9) AT unit control signal

For the preset AT, the CPU controls the rotational direction and speed of the variable capacitor drive motors so that they stop at the preset position according to the AT select data from the option select menu, AT-450 installation signal, variable capacitor position data, and preset position data. The tap signal from the tuning circuit is synthesized from the transmit LPF select signal from the filter unit.

The AT-300 control signal handshakes the AT-300 in both directions to perform tuning.

The AT-450 does not tune in the 1.9MHz and 50MHz bands. The AT-300 does not tune in the 50MHz band, so take care when connecting a 50MHz-band antenna.



CIRCUIT DESCRIPTION

10) Serial interface

The CPU contains an asynchronous serial interface to support TTL level serial communication. The TS-690S/450S uses the serial port to communicate with a personal computer, control the DSP-100, and transfer data between two communication devices. Data is TTL level with one start bit, 8 data bits, two stop bits, and 4800-bps transmission speed.

11) Key scan

Ports S0 to S5 and K0 to K6 form a keyboard matrix. When the switch at an intersection in the matrix is pressed, ports K0 to K6 go low. Thus, which switch has been pressed can be detected by software. The keys are debounced by software.

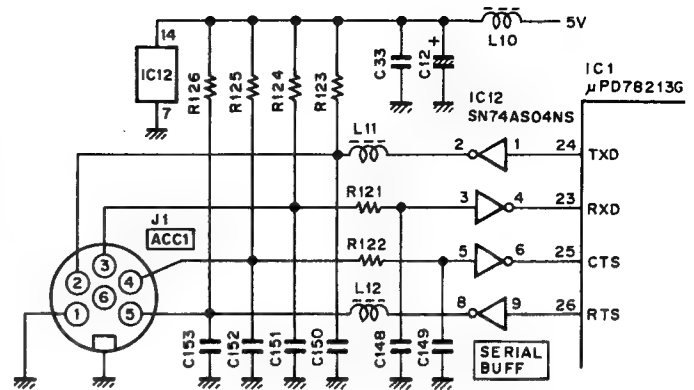


Fig. 31 Serial interface circuit

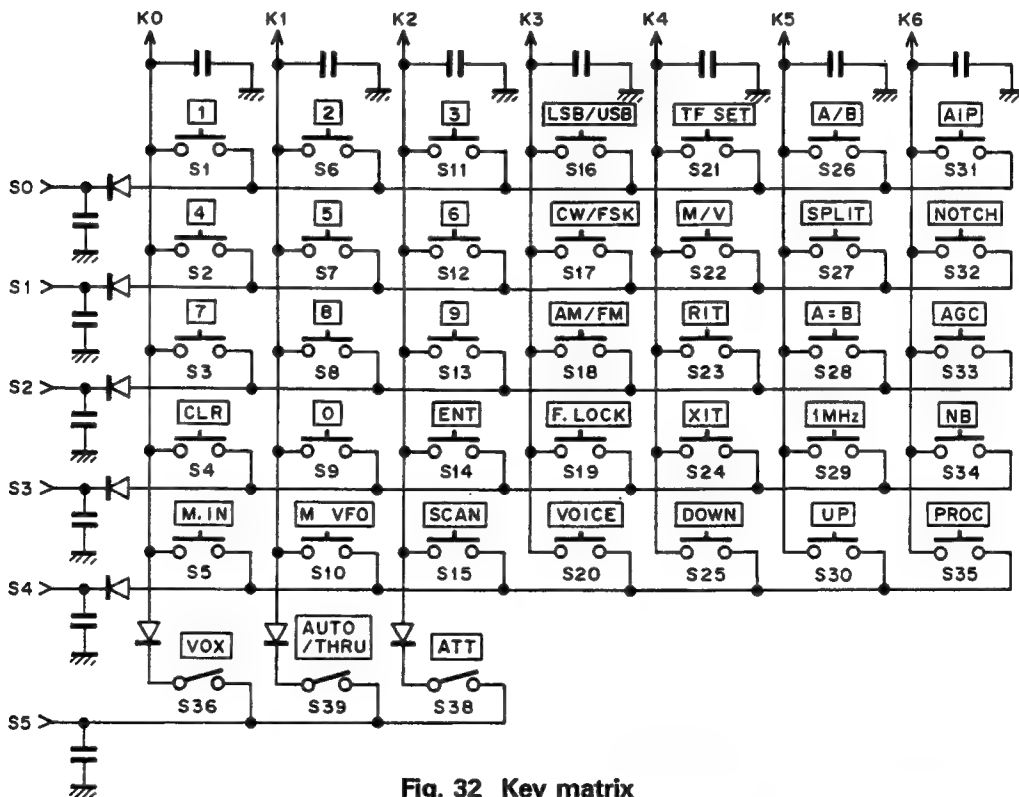


Fig. 32 Key matrix

12) Beep

The beep signal is generated by the timer in the CPU. The enable data (beep on/off, mode beep, warning Morse) of the extended menu is recognized, and the necessary code output. The short point length is about 40ms, the long, about 120ms. The oscillation frequency is about 1.2kHz.

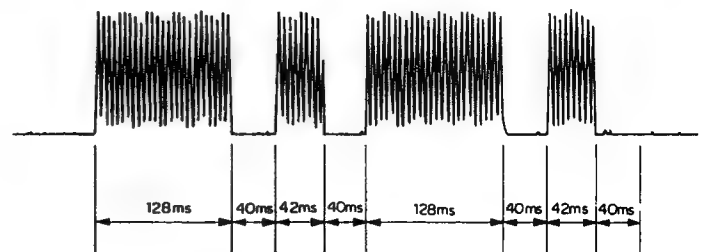


Fig. 33 Output waveform of Morse code C

CIRCUIT DESCRIPTION

13) EEPROM

To prevent backup problems, the minimum necessary adjustment data is stored in EEPROM. The EEPROM is accessed with 11-bit serial data, and data can be written to and read from the EEPROM.

14) Analog Input

The CPU incorporates an analog-to-digital (A/D) converter, so analog signals can be input directly. A protection resistor, zener diode, and pascon are connected to the input pins of the converter. Incoming analog signals are digitized for display on the meter and to drive the AT motor.

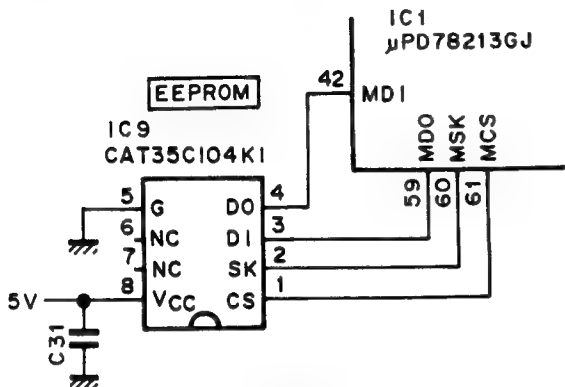


Fig. 34 EEPROM circuit

| Port name | Signal name | Details |
|-----------|-------------|---|
| AN0 | SM | S-meter voltage (during reception only) |
| AN1 | REV | Reflected wave voltage (during transmission only) |
| AN2 | ALDB | AF meter voltage (during reception only), ALC meter voltage (during transmission only) |
| AN3 | RFM | Power meter voltage (during transmission only) |
| AN4 | POD2 | AT variable capacitor 2 position voltage |
| AN5 | POD1 | AT variable capacitor 1 position voltage |
| AN6 | IFS | IF-shift VR position voltage |
| AN7 | RIT | RIT VR position voltage |

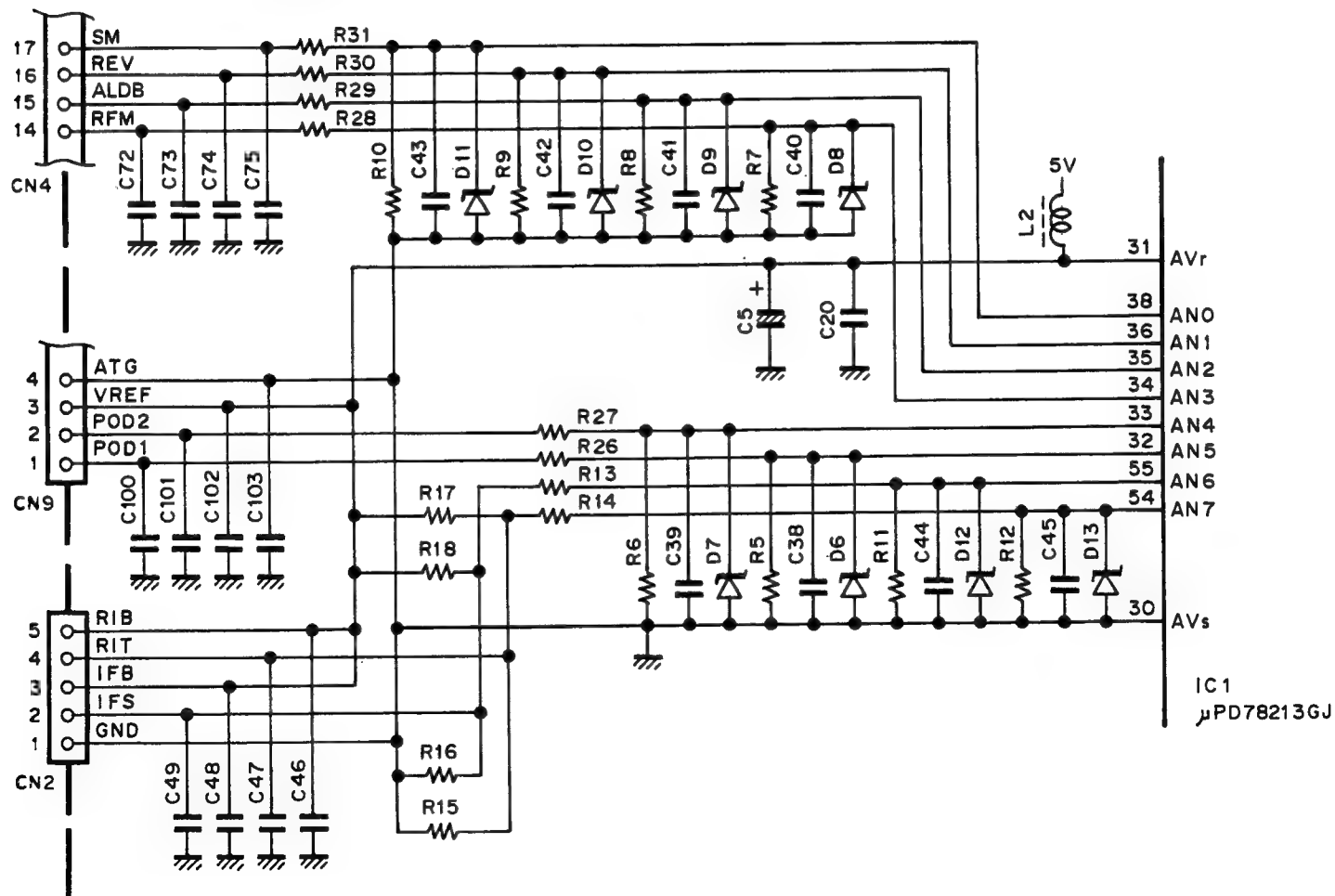


Fig. 35 Analog input circuit

CIRCUIT DESCRIPTION

15) Band data 1

| Frequency (MHz) | RX BPF DATA | | | | | TX LPF DATA | | | | VCO DATA | | | | |
|----------------------|-------------|-----|-----|-----|-----|-------------|-----|-----|-----|----------|-----|-----|-----|-----|
| | 28C | RB3 | RB2 | RB1 | RB0 | TB3 | TB2 | TB1 | TB0 | BCH | VB3 | VB2 | VB1 | VB0 |
| 0.030000~ 0.499999 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 0.500000~ 0.999999 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 1.000000~ 1.619999*1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 1.620000*2~1.999999 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 2.000000~ 2.499999 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 2.500000~ 2.999999 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 3.000000~ 3.499999 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 3.500000~ 3.999999 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 4.000000~ 4.499999 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 4.500000~ 4.999999 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 5.000000~ 5.499999 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 5.500000~ 5.999999 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 6.000000~ 6.499999 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 6.500000~ 6.999999 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 7.000000~ 7.499999 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 7.500000~ 7.999999 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 8.000000~ 8.499999 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 8.500000~ 8.999999 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 9.000000~ 9.499999 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 9.500000~ 9.999999 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 10.000000~10.499999 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 10.500000~10.999999 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 11.000000~11.499999 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 11.500000~11.999999 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 12.000000~12.499999 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 12.500000~12.999999 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 13.000000~13.499999 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 13.500000~13.999999 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 14.000000~14.499999 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| 14.500000~14.999999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 15.000000~15.499999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 15.500000~15.999999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 16.000000~16.499999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 16.500000~16.999999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 17.000000~17.499999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 17.500000~17.999999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 18.000000~18.499999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 18.500000~18.999999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 19.000000~19.499999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 19.500000~19.999999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 20.000000~20.499999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 20.500000~20.999999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 21.000000~21.499999 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 21.500000~21.999999 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 22.000000~22.499999 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 22.500000~22.999999 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 23.000000~23.499999 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 23.500000~23.999999 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 24.000000~24.499999 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |

*1 : 1.704999 for K type only.

*2 : 1.705000 for K type only

CIRCUIT DESCRIPTION

| Frequency (MHz) | RX BPF DATA | | | | | TX LPF DATA | | | | VCO DATA | | | | |
|---------------------|-------------|-----|-----|-----|-----|-------------|-----|-----|-----|----------|-----|-----|-----|-----|
| | 28C | RB3 | RB2 | RB1 | RB0 | TB3 | TB2 | TB1 | TB0 | BCH | VB3 | VB2 | VB1 | VB0 |
| 24.500000~24.999999 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| 25.000000~25.499999 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 25.500000~25.999999 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 26.000000~26.499999 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 26.500000~26.999999 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 27.000000~27.499999 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 27.500000~27.999999 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 28.000000~28.499999 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 28.500000~28.999999 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 29.000000~29.499999 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 29.500000~29.999999 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |

16) Band data 2

| Frequency (MHz) | RX BPF DATA | | | | | TX LPF DATA | | | | VCO DATA | | | | |
|---------------------|-------------|-----|-----|-----|-----|-------------|-----|-----|-----|----------|-----|-----|-----|-----|
| | 28C | RB3 | RB2 | RB1 | RB0 | TB3 | TB2 | TB1 | TB0 | BCH | VB3 | VB2 | VB1 | VB0 |
| 30.000000~30.499999 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 30.500000~30.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 31.000000~31.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 31.500000~31.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 32.000000~32.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 32.500000~32.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 33.000000~33.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 33.500000~33.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 34.000000~34.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 34.500000~34.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 35.000000~35.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 35.500000~35.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 36.000000~36.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 36.500000~36.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 37.000000~37.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 37.500000~37.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 38.000000~38.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 38.500000~38.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 39.000000~39.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 39.500000~39.999999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 40.000000~40.499999 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 40.500000~40.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41.000000~41.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41.500000~41.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 42.000000~42.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 42.500000~42.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 43.000000~43.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 43.500000~43.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 44.000000~44.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 44.500000~44.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 45.000000~45.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 45.500000~45.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

CIRCUIT DESCRIPTION

| Frequency (MHz) | RX BPF DATA | | | | | TX LPF DATA | | | | VCO DATA | | | | |
|---------------------|-------------|-----|-----|-----|-----|-------------|-----|-----|-----|----------|-----|-----|-----|-----|
| | 28C | RB3 | RB2 | RB1 | RB0 | TB3 | TB2 | TB1 | TB0 | BCH | VB3 | VB2 | VB1 | VB0 |
| 46.000000~46.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 46.500000~46.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 47.000000~47.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 47.500000~47.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 48.000000~48.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 48.500000~48.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 49.000000~49.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 49.500000~49.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 50.000000~50.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 50.500000~50.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 51.000000~51.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 51.500000~51.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 52.000000~52.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 52.500000~52.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 53.000000~53.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 53.500000~53.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 54.000000~54.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 54.500000~54.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 55.000000~55.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 55.500000~55.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 56.000000~56.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 56.500000~56.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 57.000000~57.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 57.500000~57.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 58.000000~58.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 58.500000~58.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 59.000000~59.499999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 59.500000~59.999999 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

CIRCUIT DESCRIPTION

17) Function of IC pins

• Main CPU : μ PD78213GJ (IC1)

| Port name | Pin No. | Name | Function | I/O | Remarks |
|-----------|---------|-------------|---|-----|-----------------------|
| P00 | 44 | LLE3 | LED driver enable | O | |
| P01 | 45 | LDA | Display data | O | |
| P02 | 46 | LCK | Display clock | O | |
| P03 | 48 | LLE1 | LCD driver 1 enable | O | |
| P04 | 49 | LLE2 | LCD driver 2 enable | O | |
| P05 | 50 | P05 | Unused | O | |
| P06 | 51 | LBL | Display control output | O | "H" : Display |
| P07 | 53 | P07 | Unused | O | |
| P20 | 14 | NMI | Unused | I | |
| P21~P26 | 15~20 | INTP0~INTP5 | Unused | I | |
| P27 | 21 | SI | Unused | I | |
| P30 | 23 | RXD | Serial receive data | I | |
| P31 | 24 | TXD | Serial transmit data | O | |
| P32 | 25 | CTS | Serial transmission enable | I | |
| P33 | 26 | RTS | Serial transmission request | O | |
| P34,P35 | 39,41 | TO0,TO1 | Unused | O | |
| P36 | 42 | MDI | Input from EEPROM | I | |
| P37 | 43 | BZ | Beep output | O | |
| P60 | 61 | MCS | EEPROM chip select | O | |
| P61 | 60 | MSK | EEPROM serial clock | O | |
| P62 | 59 | MDO | Output to EEPROM | O | |
| P63 | 58 | STR | VS-2 synthesis start signal | O | "H" : Synthesis start |
| AN0 | 38 | SM | S-meter voltage | I | |
| AN1 | 36 | REV | Reflected wave voltage | I | |
| AN2 | 35 | ALAF | AF voltage (RX)/ALC voltage (TX) | I | |
| AN3 | 34 | RFM | Power meter voltage | I | |
| AN4 | 33 | POD2 | AT variable capacitor 2 position voltage | I | |
| AN5 | 32 | POD1 | AT variable capacitor 1 position voltage | I | |
| AN6 | 55 | IFS | IF SHIFT potentiometer position voltage | I | |
| AN7 | 54 | RIT | RIT potentiometer position voltage | I | |
| P40~P47 | 2~11 | AD0~AD7 | CPU data bus | I/O | |
| P50~P57 | 1~68 | A8~A15 | CPU address bus | O | |
| RD,WR | 57,56 | RD,WR | Read, write signal | O | |
| ASTB | 12 | ASTB | Address/data separation signal | O | |
| RESET | 63 | RESET | Reset signal | I | "L" : Reset |
| X1,X2 | 64,65 | X1,X2 | CPU clock crystal pin | I | f : 11.0592MHz |
| AVref | 31 | AVref | Analog-to-digital converter reference voltage input | I | |
| AVss | 30 | AVss | Analog-to-digital converter ground pin | I | |

CIRCUIT DESCRIPTION

• Extended I/O : CXD1095Q (IC6)

| Port name | Pin No. | Name | Function | I/O | Remarks |
|-----------|---------|-------|-------------------------------------|-----|---------------------------------|
| PA0 | 54 | CDA | DDS serial data | O | |
| PA1 | 55 | CCK | DDS clock | O | |
| PA2 | 56 | CLE1 | DDS1 enable | O | |
| PA3 | 59 | ABSL | DDS1 register selection | O | |
| PA4 | 60 | CLE2 | DDS2 enable | O | |
| PA5 | 61 | CASL | DDS2 register selection | O | |
| PA6 | 62 | | | O | |
| PA7 | 63 | BCH | PLL band signal | O | |
| PB0 | 64 | VB0 | VCO0 select signal | O | |
| PB1 | 3 | VB1 | VCO1 select signal | O | |
| PB2 | 4 | VB2 | VCO2 select signal | O | |
| PB3 | 5 | VB3 | VCO3 select signal | O | |
| PB4 | 6 | PLE1 | PLL1 enable | O | |
| PB5 | 7 | PCK | PLL clock | O | |
| PB6 | 8 | PLE2 | PLL2 enable | O | |
| PB7 | 9 | PDA | PLL serial data | O | |
| PC0 | 11 | FDA | IF parallel converter data | O | |
| PC1 | 12 | FCK | IF parallel converter clock | O | |
| PC2 | 13 | FLE1 | IF parallel converter 1 enable | O | |
| PC3 | 14 | FLE2 | IF parallel converter 2 enable | O | |
| PC4 | 15 | TOB | Tone unit control signal | O | "H" : Tone on |
| PC5 | 16 | LIN | Linear standby relay control signal | O | "H" : Linear on |
| PC6 | 17 | ABK | AF blanking signal | O | "H" : Blanking on |
| PC7 | 18 | TXI | Transmission band data | O | "L" : Trnasmission inhibit band |
| PD0 | 20 | ESS | Forced transmission command signal | O | "H" : Transmission command |
| PD1 | 21 | SD | VS-2 synthesis data | O | |
| PD2 | 22 | SCK | VS-2 clock | O | |
| PD3 | 23 | | | O | |
| PD4 | 24 | 50HG | 50MHz band final signal | I | "L" : 50MHz band, 50W |
| PD5 | 27 | HFHG | HF band final signal | I | "L" : HF band, 100W |
| PD6 | 28 | CSS | SEND switch input | I | "L" : Transmission command |
| PD7 | 29 | DBC | External DSP connection signal | I | "L" : External DSP connected |
| PE0 | 49 | UL | PLL unlock input | I | "L" : Unlock |
| PE1 | 50 | BSY | VS-2 busy signal | I | "H" : Busy |
| PE2 | 52 | MU | MIC UP switch input | I | "L" : Switch on |
| PE3 | 53 | MD | MIC DOWN switch input | I | "L" : Switch on |
| D0~D7 | 30~39 | D0~D7 | Data bus | I/O | |
| A0~A2 | 46~48 | A0~A2 | Address bus | I | |
| CS | 45 | CS | Chip select signal | I | |
| RD,WR | 43,44 | RD,WR | Read, write signal | I | |
| ODEN | 41 | ODEN | Output disable | I | Connect to RESET |

CIRCUIT DESCRIPTION

• Extended I/O : CXD1095Q (IC7)

| Port name | Pin No. | Name | Function | I/O | Remarks |
|-----------|---------|-------|-------------------------------------|-----|-------------------------|
| PA0~PA2 | 54~56 | S0~S2 | Key matrix select output | O | "L" : Column 1 selected |
| PA3~PA5 | 59~61 | S3~S5 | Key matrix select output | O | "L" : Column 1 selected |
| PA6 | 62 | | | O | |
| PA7 | 63 | S7 | Diode matrix select output | O | "L" : Select |
| PB0 | 64 | K0 | Key matrix input | I | |
| PB1~PB6 | 3~8 | K1~K6 | Key matrix input | I | |
| PB7 | 9 | | | I | |
| PC0 | 11 | RDA | RF parallel converter data | O | |
| PC1 | 12 | RCK | RF parallel converter clock | O | |
| PC2 | 13 | RLE1 | RF parallel converter 1 enable | O | |
| PC3 | 14 | RLE2 | RF parallel converter 2 enable | O | |
| PC4 | 15 | RBK | RF blanking signal | O | "H" : Blanking on |
| PC5 | 16 | | | O | |
| PC6 | 17 | TSO | AT-300 control output | O | |
| PC7 | 18 | TTO | AT-300 control output | O | |
| PD0 | 20 | PR22 | AT-450 motor rotation output | O | |
| PD1 | 21 | PR21 | AT-450 motor rotation output | O | |
| PD2 | 22 | PR12 | AT-450 motor rotation output | O | |
| PD3 | 23 | PR11 | AT-450 motor rotation output | O | |
| PD4 | 24 | ATA | AT-450 AUTO/THRU signal | O | "H" : Auto |
| PD5 | 27 | APRE | AT-450 preset control select signal | O | "H" : auto |
| PD6 | 28 | SPED | AT-450 motor speed output | O | "L" : Motor stop |
| PD7 | 29 | ATL | AT TUNE LED output | O | "H" : LED on |
| PE0 | 49 | ATI | AT-450 installation signal | I | "L" : AT-450 installed |
| PE1 | 50 | | | I | |
| PE2 | 52 | TSI | AT-300 control input | I | |
| PE3 | 53 | TTI | AT-300 control input | I | |
| D0~D7 | 30~39 | D0~D7 | Data bus | I/O | |
| A0~A2 | 46~48 | A0~A2 | Address bus | I | |
| CS | 45 | CS | Chip select signal | I | |
| RD,WR | 43,44 | RD,WR | Read, write signal | I | |
| ODEN | 41 | ODEN | Output disable | I | Connect to RESET |

CIRCUIT DESCRIPTION

Option setting

If the ENT key is held down and the power switched on, options can be set. The menu number is incremented or decremented with the click encoder. Options can be changed with the UP and DOWN keys.

1) Option setting menu

| No. | Option setting menu | Setting | Initial value |
|-----|---|---------|---------------|
| 1 | AT-300 control | ON/OFF | OFF |
| 2 | IF filter (8.83-2.4k/1.8k) installation | ON/OFF | OFF |
| 3 | IF filter (8.83-500/270) installation | ON/OFF | OFF |
| 4 | IF filter (455-500/250) installation | ON/OFF | OFF |

Extended Function 1

1) Extended menu mode

If the LSB/USB key is held down and the power switched on, extended function 1 mode is entered.

2) Menu number selection

Select a menu number with the click encoder.
The menu number can be selected endlessly.

3) Menu data modification

• UP key

Increment the menu number for selection.
ON = 1
Not endless

• DOWN key

Decrement the menu number for selection.
OFF = 0
Not endless

4) Extended menu mode termination

The entered menu mode is terminated with the CLR key.

The entered menu mode is not terminated with any other key.

If the power is switched off and on again, the entered menu mode is terminated.

5) Memory protect erase inhibit

Disable erasing by the CLR key. The memory contents are erased by all resetting and A=B resetting if backup fails.

6) Memory protect write inhibit

Writing to memory is inhibited.

7) Extended function 1 menu

| No. | Extended function 1 setting menu | Setting | Initial value |
|-----|--|---------|---------------|
| 01 | Main encoder operation | ON/OFF | ON |
| 02 | Click encoder last digit rounding | ON/OFF | ON |
| 03 | Operation with numeric keys | ON/OFF | ON |
| 04 | Beep | ON/OFF | ON |
| 05 | Mode Morse | ON/OFF | ON |
| 06 | Warning Morse | ON/OFF | ON |
| 07 | 10-Hz display | ON/OFF | ON |
| 08 | Meter peak hold | ON/OFF | OFF |
| 09 | Band memory | ON/OFF | ON |
| 10 | SSB auto mode | ON/OFF | ON |
| 11 | NB2 operation | ON/OFF | ON |
| 12 | Memory channel crossing | ON/OFF | OFF |
| 13 | M.IN auto increment | ON/OFF | OFF |
| 14 | Standard memory operation with encoder | ON/OFF | OFF |
| 15 | Scan hold during program scan | ON/OFF | OFF |
| 16 | Linear control relay | ON/OFF | OFF |
| 17 | Clone function | ON/OFF | OFF |
| 18 | Clone function VFO write | ON/OFF | OFF |
| 19 | Mute mode | ON/OFF | OFF |
| 20 | Memory protect 1 (erase inhibit) | ON/OFF | OFF |
| 21 | Memory protect 2 (write inhibit) | ON/OFF | OFF |

CIRCUIT DESCRIPTION

Extended Function 2

If the MIN key is held down and the power switched on, the extended function 2 menu is selected.

1) CW pitch

The pitch can be changed in 9 levels in 50Hz steps. The sidetone is not changed when the pitch is changed. The frequency is not changed endlessly.

The pitch can be set to the following frequencies. (Initial value: 800Hz)

400 ⇄ 450 ⇄ 500 ⇄ 550 ⇄ 600 ⇄ 650 ⇄ 700 ⇄ 750 ⇄ 800Hz

2) Extended function 2 menu

| No. | Extended function 2 setting menu | Setting | Initial value |
|-----|---|---------------------|---------------|
| 31 | Built-in AT tune | ON/OFF | ON |
| 32 | Return to receive mode after AT tune | ON/OFF | ON |
| 33 | Main encoder rotation change | 5/10kHz | 10kHz |
| 34 | One step of click encoder | 1/2/5/10kHz | 10kHz |
| 35 | One step of click encoder in the AM BC band | 9/10kHz | 10kHz |
| 36 | One step of BAND UP/DOWN key | 500/1000kHz | 1000kHz |
| 37 | FSK shift width | 170/200/425/850Hz | 170Hz |
| 38 | Mark during FSK polarity keying | ON/OFF | ON |
| 39 | FSK tone | 1275/2125Hz | 2125Hz |
| 40 | CW pitch | 400~800 (50Hz step) | 800 |
| 41 | RIT variable range | ±1.1kHz/±2.2kHz | ±1.1kHz |
| 42 | HELLO display when power is switched on | ON/OFF | OFF |

Adjustment Function

1) Adjustment mode

If the AIP, XIT, and SCAN keys are held down and the power switched on, the adjustment mode is entered.

2) Menu number selection

Select the menu number with the click encoder. The menu number can be selected endlessly.

3) CLR key (adjustment menu mode)

Terminate the adjustment menu mode.

The adjustment menu mode is terminated only with the CLR key.

The adjustment menu mode is terminated when the power is switched off and on again.

For the signal-strength meter setting, when the UP key is pressed at point S9 and the full-scale point, a meter curve is automatically created according to the preset S0 point and signal-strength meter voltages at three points.

For the ALC meter setting, a meter curve is automatically created according to three points: ALC start, ALC ZONE MAX, and ALC full scale.

When adjustment ends, carry out #17 EEPROM write, and after the beep, carry out the next operation. If the operation is canceled in the middle, or the power is switched off, data is not written to the EEPROM.

CIRCUIT DESCRIPTION

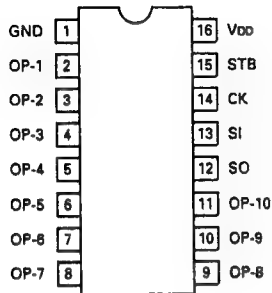
4) Adjustment menu

| No. | Adjustment menu | Setting | Initial value |
|-----|--|--------------------------------|---------------|
| 01 | CS (Checksum) | XXXX | – |
| 02 | Write adjusted frequency into Mch with the UP key | – | – |
| 03 | Change the transmit/receive frequency (Mch number) The frequency is not changed if the UP/DN key is not pressed | Channel number is displayed | ch00 |
| 04 | Set RIT zero adjustment VR to zero position, and press the UP key | ~ | default |
| 05 | Set IFS zero adjustment VR to zero position, and press the UP key | ~ | default |
| 06 | IF filter selection 8.83/2.4k, 455/2.4k | – | None |
| 07 | IF filter selection 8.83/500, 455/500 | – | None |
| 08 | Signal-strength meter table low band UP key when SSG = S9. UP key when SSG = S9+60 | | default |
| 09 | Signal-strength meter table middle band UP key when SSG = S9. UP key when SSG = S9+60 | | default |
| 10 | Signal-strength meter table high band UP key when SSG = S9. UP key when SSG = S9+60 | | default |
| 11 | Carrier point LSB adjustment 10-Hz step. Forced to LSB mode | –40~40 | 0 |
| 12 | Carrier point USB adjustment 10-Hz step. Forced to USB mode | –40~40 | 0 |
| 13 | ALC meter table Press the UP key at ALC start Press the UP key at ALC ZONE MAX Press the UP key at ALC full scale | | default |
| 14 | Receive DSP signal (RDC) is forced on | ON/OFF | OFF |
| 15 | Transmit DSP signal (TDC) is forced on | ON/OFF | OFF |
| 16 | AT10 compulsorily on | ON/OFF | OFF |
| 17 | EEPROM write Press the UP or DN key. A beep sounds when the write ends | | – |

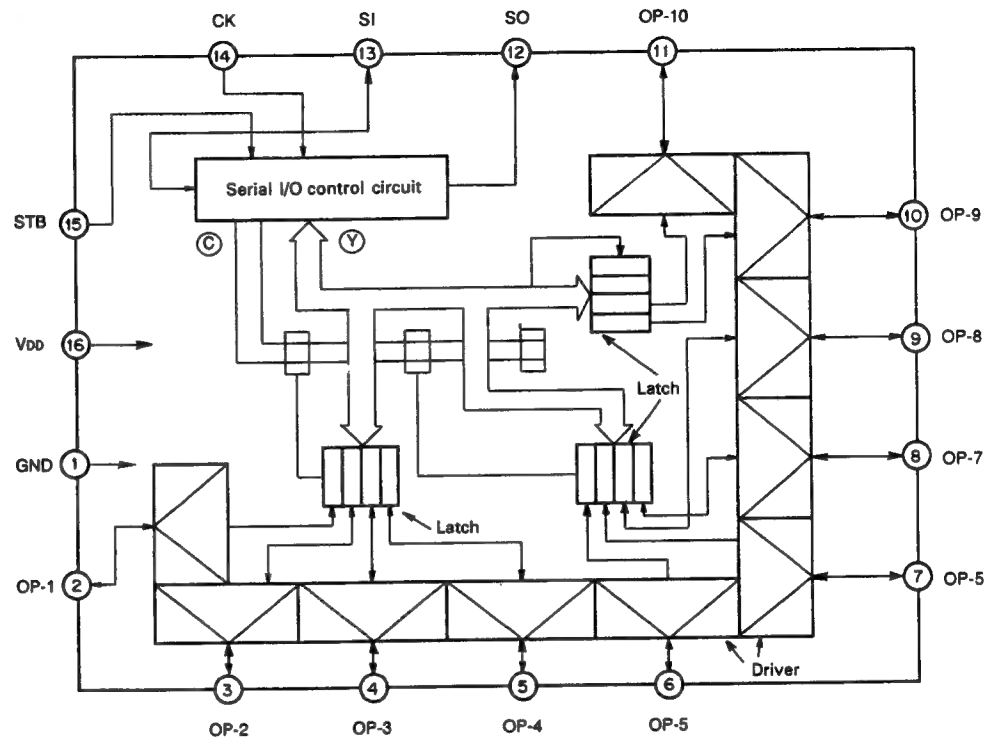
SEMICONDUCTOR DATA

I/O Port Expanding Interface : TC9174F (RF unit IC1, 3)

• Terminal connection diagram



• Block diagram



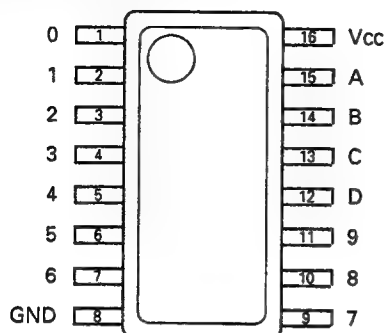
• Terminal function

| Pin No. | Symbol | Pin name | Function / Operation |
|---------|--------|---|--|
| 1 | GND | Power supply pin | Supplies 5V \pm 10%. |
| 2 | OP-1 | General-purpose output port No. 1~10 | General-purpose output port. Nch open drain output for high withstand voltage and high current drive. Sink current : 10mA MIN Withstand voltage : 18V MIN |
| 3 | OP-2 | | |
| 4 | OP-3 | | |
| 5 | OP-4 | | |
| 6 | OP-5 | | |
| 7 | OP-6 | | |
| 8 | OP-7 | | |
| 9 | OP-8 | | |
| 10 | OP-9 | | |
| 11 | OP-10 | | |
| 12 | SO | Serial output | Data output port of serial I/O port, Pch open drain output. |
| 13 | SI | Serial input | Data input port of serial I/O port, schmitt input. |
| 14 | CK | Clock signal input | Clock signal input port of serial I/O port, schmitt input. |
| 15 | STB | Strobe signal input | Strobe input serial I/O port, schmitt input. |
| 16 | VDD | Power supply pin | Supplies 5V \pm 10%. |

SEMICONDUCTOR DATA

BCD-Decimal : SN74LS145NS (RF unit IC2)

• Terminal connection diagram



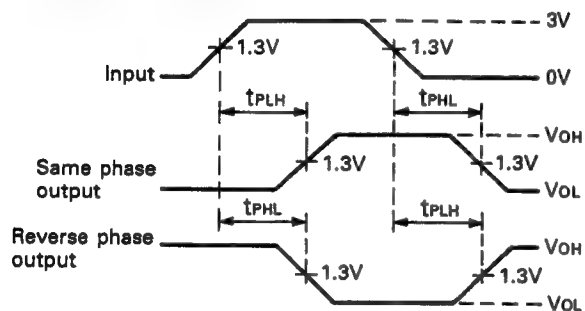
• Function table

| No. | Input | | | | Output | | | | | | | | | |
|------------|-------|---|---|---|--------|---|---|---|---|---|---|---|---|---|
| | D | C | B | A | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | L | L | L | L | L | H | H | H | H | H | H | H | H | H |
| 1 | L | L | L | H | H | L | H | H | H | H | H | H | H | H |
| 2 | L | L | H | L | H | H | L | H | H | H | H | H | H | H |
| 3 | L | L | H | H | H | H | H | L | H | H | H | H | H | H |
| 4 | L | H | L | L | H | H | H | H | L | H | H | H | H | H |
| 5 | L | H | L | H | H | H | H | H | H | L | H | H | H | H |
| 6 | L | H | H | L | H | H | H | H | H | H | L | H | H | H |
| 7 | L | H | H | H | H | H | H | H | H | H | H | L | H | H |
| 8 | H | L | L | L | H | H | H | H | H | H | H | H | L | H |
| 9 | H | L | L | H | H | H | H | H | H | H | H | H | H | L |
| Invalidity | H | L | H | L | H | H | H | H | H | H | H | H | H | H |
| | H | L | H | L | H | H | H | H | H | H | H | H | H | H |
| | H | H | L | L | H | H | H | H | H | H | H | H | H | H |
| | H | H | H | L | H | H | H | H | H | H | H | H | H | H |
| | H | H | H | H | H | H | H | H | H | H | H | H | H | H |

H : High level, L : Low level

• Switching time waveform

(Voltage waveform of transmission delay time)

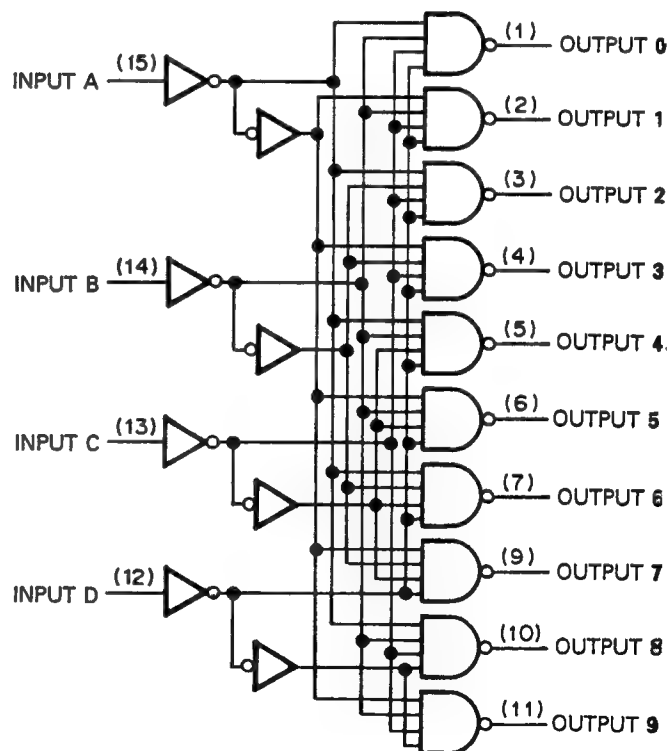


Condition of all input waveform

Repeat frequency : $PRR \leq 1\text{MHz}$, $t_r \leq 15\text{ns}$, $t_f \leq 6\text{ns}$

Duty cycle : 50%

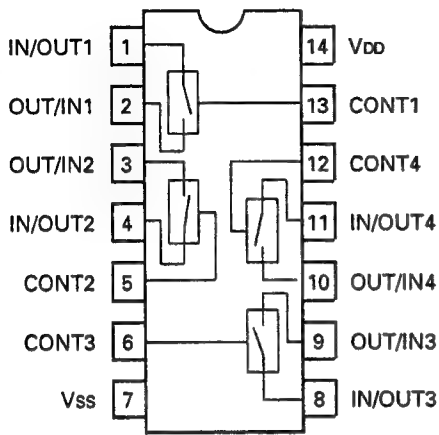
• Block diagram



SEMICONDUCTOR DATA

Analog Switch : TC4066BF (RF unit IC4)

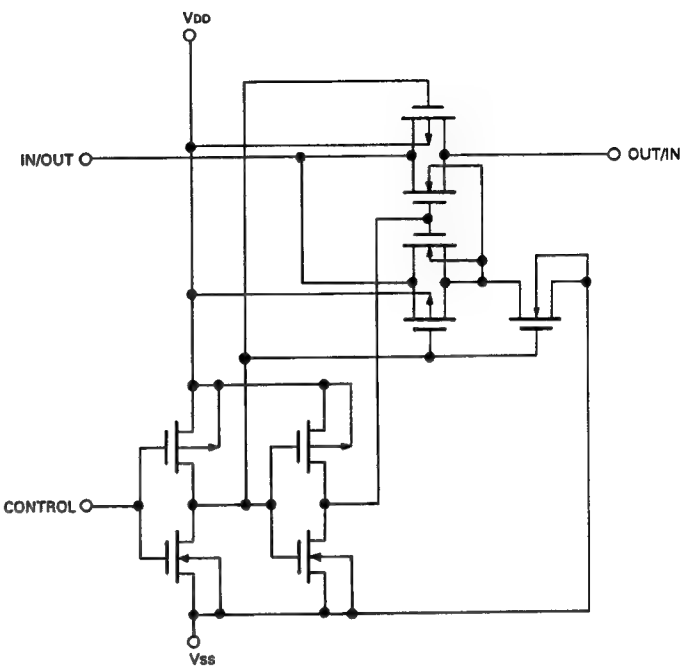
• Terminal connection diagram



• Truth table

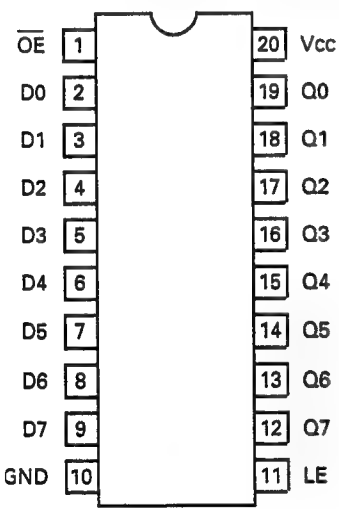
| Control | Impedance between IN/OUT - OUT/IN |
|---------|--------------------------------------|
| H | $0.5 \sim 5 \times 10^2 \Omega$ |
| L | $> 10^9 \Omega$ |

• Circuit diagram

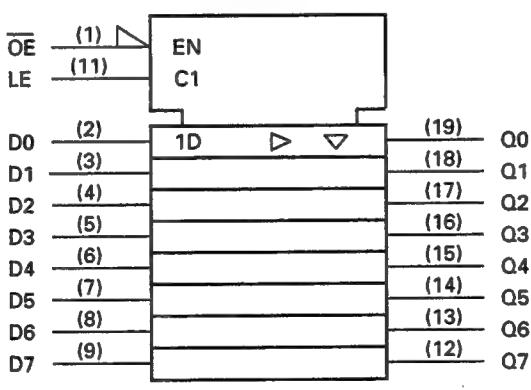


Address Latch : TC74HC573AF (Digital unit IC4)

• Terminal connection diagram



• Logic circuit diagram

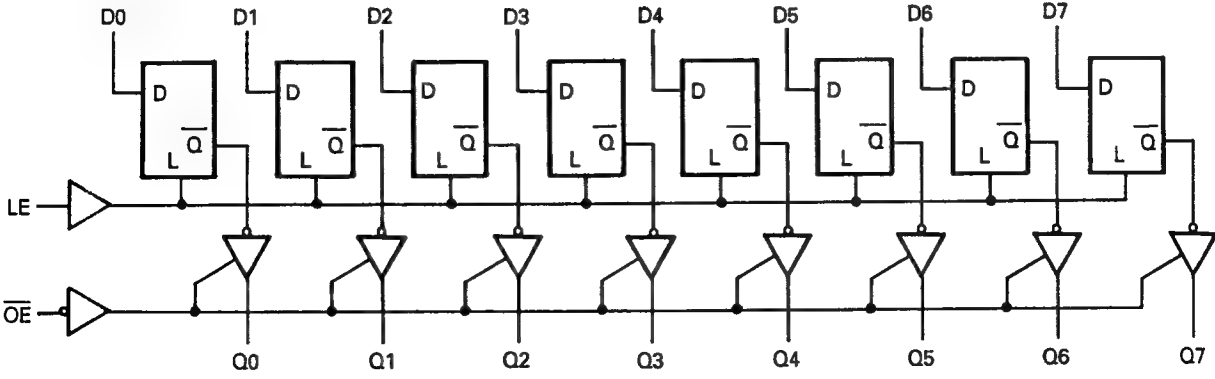


• Truth table

| Inputs | | | Outputs |
|--------|----|---|---------|
| OE | LE | D | Q |
| H | X | X | HZ |
| L | L | X | Qn |
| L | H | L | L |
| L | H | H | H |

X : Don't care
HZ : High impedance
Qn : Q-output level before
LE comes to "L"

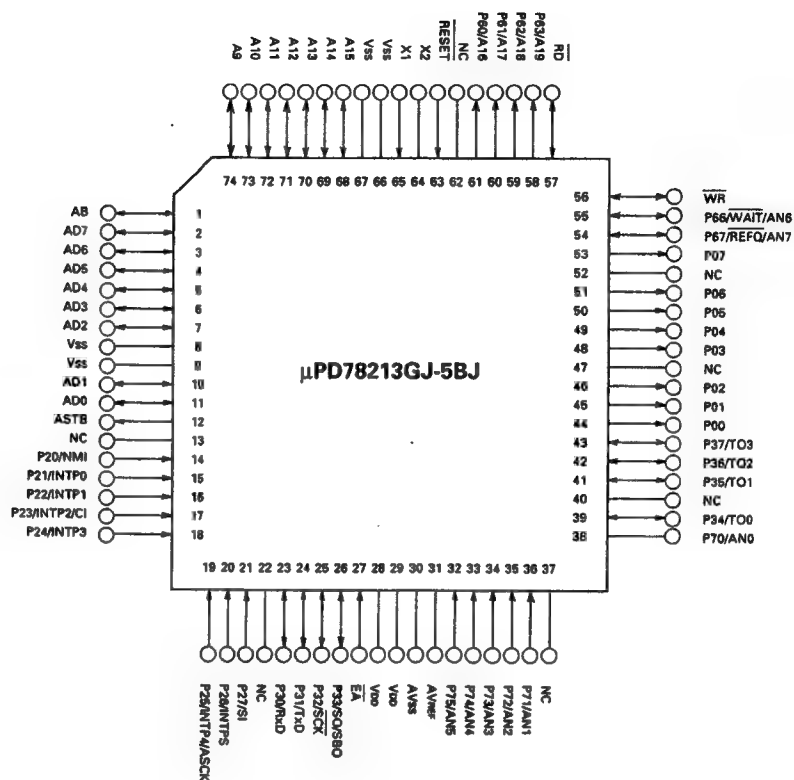
• System diagram



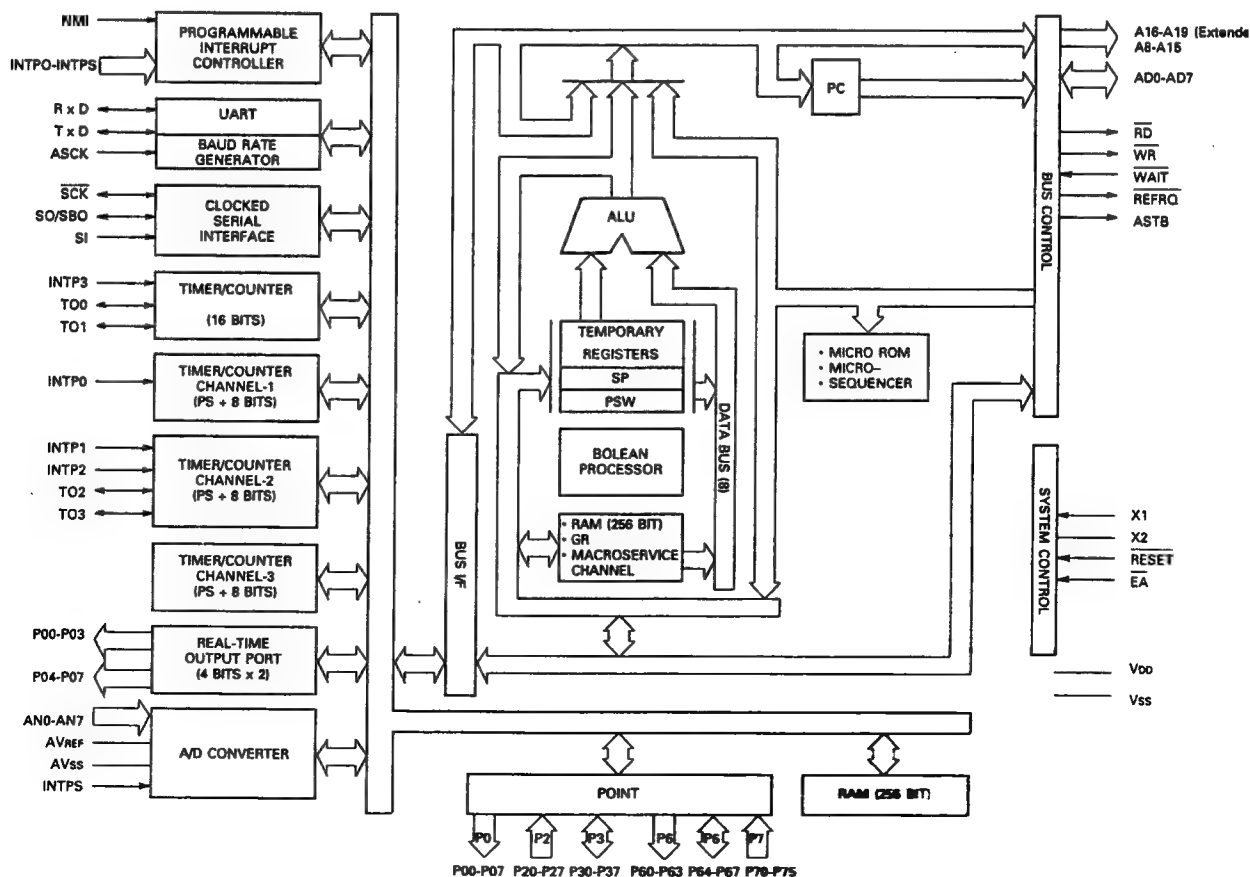
SEMICONDUCTOR DATA

CPU : μ PD78213GJ-5BJ (Digital unit IC1)

- **Terminal connection diagram**



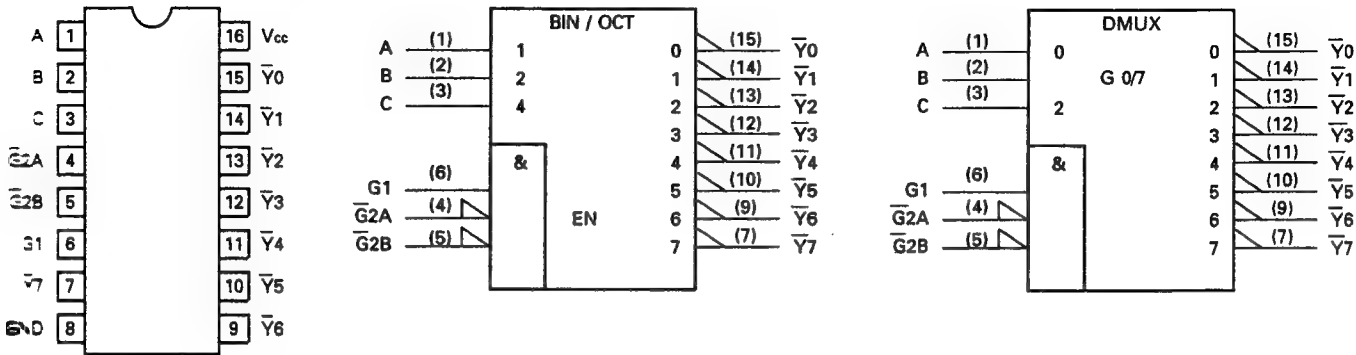
- **Block diagram**



SEMICONDUCTOR DATA

Address Decoder : TC74HC138AF (Digital unit IC5)

- Terminal connection diagram
- Logic diagram

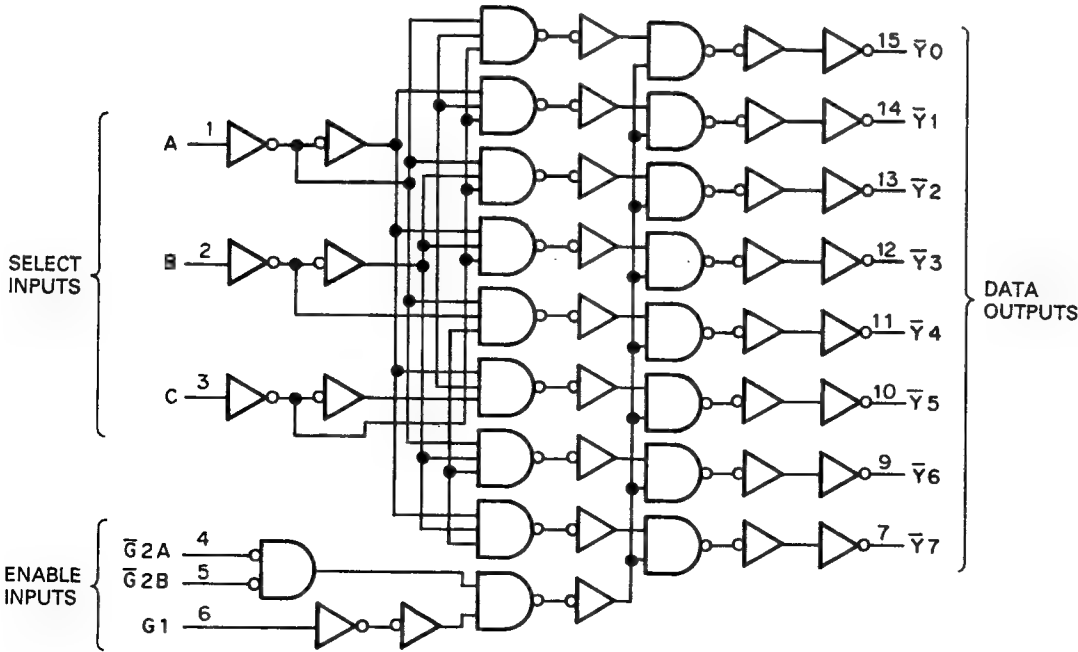


• Truth table

| Inputs | | | | | | Outputs | | | | | | | | Selected Output |
|--------|-----|-----|--------|---|---|---------|----|----|----|----|----|----|----|-----------------|
| Enable | | | Select | | | | | | | | | | | |
| G1 | G2A | G2B | C | B | A | Y0 | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 | |
| L | X | X | X | X | X | H | H | H | H | H | H | H | H | NONE |
| X | H | X | X | X | X | H | H | H | H | H | H | H | H | NONE |
| X | X | H | X | X | X | H | H | H | H | H | H | H | H | NONE |
| H | L | L | L | L | L | L | H | H | H | H | H | H | H | Y0 |
| H | L | L | L | L | H | H | L | H | H | H | H | H | H | Y1 |
| H | L | L | L | H | L | H | H | L | H | H | H | H | H | Y2 |
| H | L | L | L | H | H | H | H | H | L | H | H | H | H | Y3 |
| H | L | L | H | L | L | H | H | H | H | L | H | H | H | Y4 |
| H | L | L | H | L | H | H | H | H | H | H | L | H | H | Y5 |
| H | L | L | H | H | L | H | H | H | H | H | H | L | H | Y6 |
| H | L | L | H | H | H | H | H | H | H | H | H | H | L | Y7 |

X: Don't care

System diagram

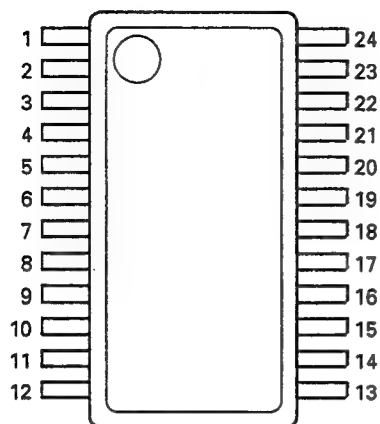


TS-450S/690S

SEMICONDUCTOR DATA

Encoder Gate Array : LZ92K371 (Digital unit IC8)

• Terminal connection diagram



• Description of terminal

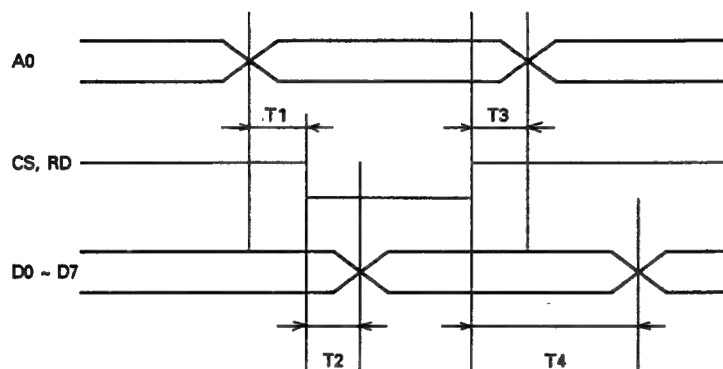
| Pin No. | I/O | Signal name | Pin No. | I/O | Signal name |
|---------|-----|-------------|---------|-----|-------------|
| 1 | — | GND | 13 | TO | D7 |
| 2 | — | NC | 14 | — | NC |
| 3 | ICU | CK3 | 15 | TO | D6 |
| 4 | ICU | CK4 | 16 | TO | D5 |
| 5 | ICU | CK1 | 17 | — | NC |
| 6 | ICU | CK2 | 18 | TO | D4 |
| 7 | — | NC | 19 | TO | D3 |
| 8 | IC | A0 | 20 | TO | D2 |
| 9 | IC | CS | 21 | — | NC |
| 10 | IC | RD | 22 | TO | D1 |
| 11 | — | NC | 23 | TO | D0 |
| 12 | — | GND | 24 | — | Vcc |

IC : Input terminal (Input CMOS level)

ICU : Input terminal (Input CMOS level, with pull-up resistor)

TO : Output terminal (Tristate output buffer)

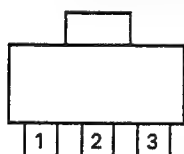
• AC response



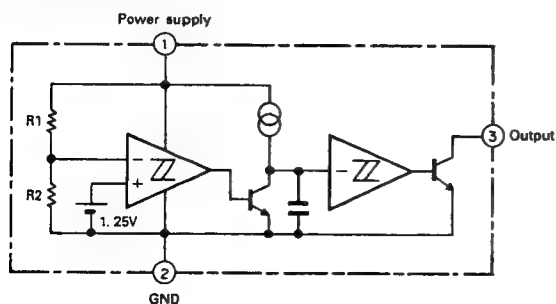
| Item | Symbol | Min | Typ | Max | Unit |
|---------------------------|--------|-----|-----|-----|------|
| Address CS, RD setup time | T1 | 50 | | | ns |
| CS, RD access time | T2 | | | 200 | ns |
| Address hold time | T3 | 0 | | | ns |
| CS output hold time | T4 | 20 | | | ns |

System Reset : M51951BML (Digital unit IC10)

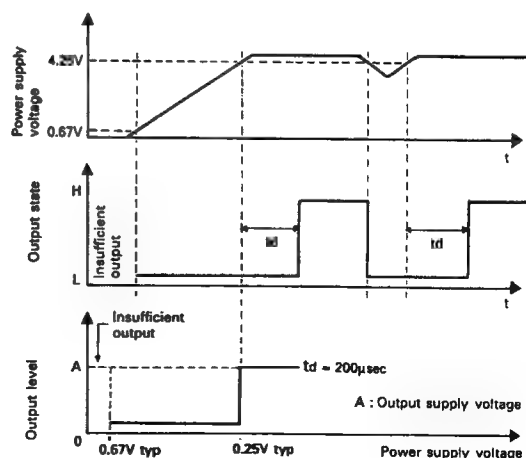
• Terminal connection diagram



• Block diagram



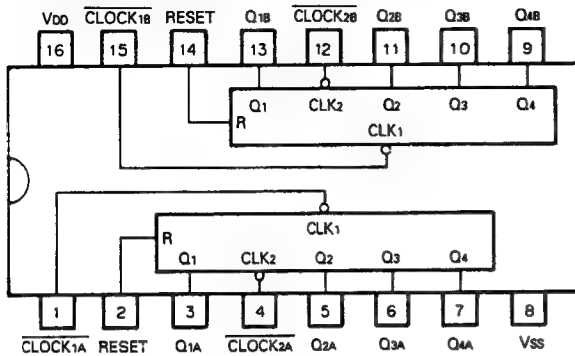
• Operation waveform



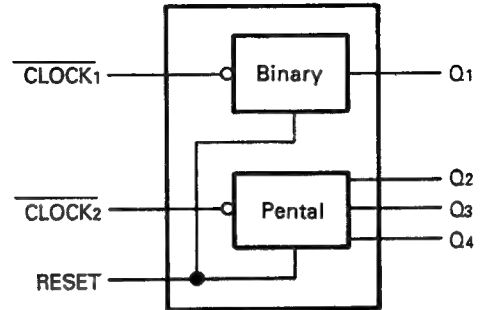
SEMICONDUCTOR DATA

Frequency Divider : μ PD74HC390G (PLL unit IC1, 2)

• Terminal connection diagram



• Block diagram

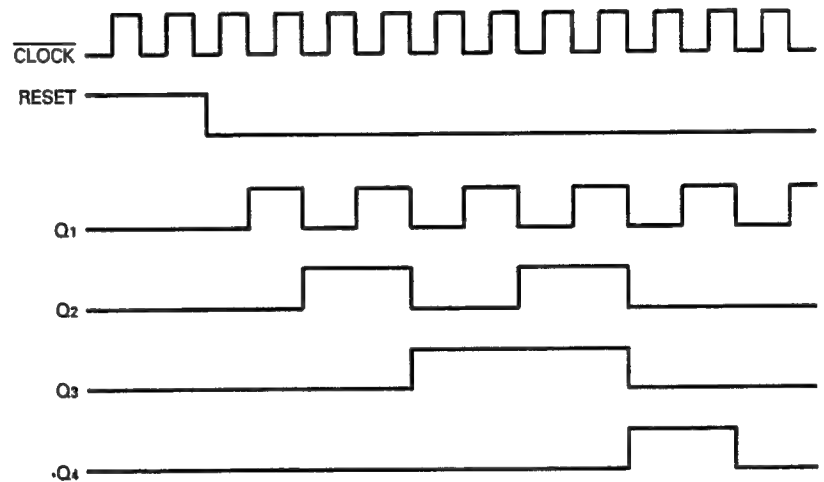


• Truth table

| CLOCK | | RESET | OUTPUT |
|-------|------|-------|--------------|
| CLK1 | CLK2 | | |
| X | X | H | L |
| | X | L | Binary count |
| X | | L | Pental count |

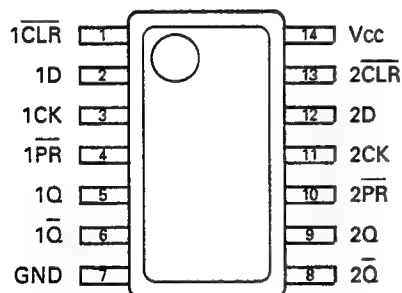
H : High level
 L : Low level
 X : H or L

• Timing chart (When connecting Q1 with CLOCK)



D-FF : SN74S74NS (AT unit IC1)

• Terminal connection diagram



• Function table

| Input | | | | Output | |
|-------|-----|------------|---|--------|-----------|
| PR | CLR | CK | D | Q | \bar{Q} |
| L | H | X | X | H | L |
| H | L | X | X | L | H |
| L | L | X | X | ? | ? |
| H | H | \uparrow | H | H | L |
| H | H | \uparrow | L | L | H |
| H | H | L | X | Qo | Qo |

H : High level \uparrow : Rising edge
 L : Low level Qo : State before \uparrow
 X : No indication ? : Unstable state

DESCRIPTION OF COMPONENTS

RF UNIT (X44-3130-XX) -00 : TS-690S -01 : TS-450S

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|-----------|---------------------------------|--|
| Q1,2 | DC switch | K1 control when ATT. |
| Q3 | RF amplifier | 21.5MHz~40.5MHz |
| Q4 | Buffer | 21.5MHz~40.5MHz |
| Q5 | DC switch | RX signal line to GND when TX. |
| Q6 | DC switch | On when 21.5MHz~26.5MHz, off when 26.5MHz~40.5MHz. |
| Q7 | RF amplifier | 40.5MHz~60MHz. (TS-690 only) |
| Q8 | BUffer | 40.5MHz~60MHz. (TS-690 only) |
| Q9,10 | RX RF amplifier | When AIP off. |
| Q11,12 | DC switch | On when AIP on. |
| Q13 | DC switch | Off when AIP on. |
| Q14~17 | RX 1st mixer | fix → 73.05MHz. |
| Q18 | TX RF amplifier | Drive output. |
| Q19 | TX amplifier | |
| Q20,21 | TX 3rd mixer | Conversion transmission frequency 73.05MHz. |
| Q22,23 | DC switch | Off when ~40.5MHz, on when 40.5MHz~60MHz. |
| Q24 | VCO amplifier | |
| Q25 | IF amplifier | 73.05MHz. |
| Q26,27 | 2nd mixer | 73.05MHz → 8.83MHz. |
| Q28 | IF amplifier | 8.83MHz. |
| Q29,30 | 3rd mixer | 8.83MHz → 455kHz. |
| Q31 | Buffer | 8.83MHz for NB. |
| Q32~34 | Amplifier | 8.83MHz for NB. |
| Q35 | Switching | For NB2. |
| Q36 | Buffer | For NB. |
| Q37,39,40 | Switching | For NB1. |
| Q38 | AGC amplifier | For NB. |
| Q41 | Switching | For RBK. |
| Q42 | Switching | When NB and RBK. |
| Q43 | Switching | On when RBC. |
| Q45,46 | TX 2nd mixer | 8.83MHz → 73.05MHz. |
| Q48 | IF amplifier | 8.83MHz ALC, CKY. |
| IC1 | Interface for I/O port extended | RF BPF. |
| IC2 | BCD → decimal | RF BPF selection. |
| IC3 | Interface for I/O port extended | 8.83MHz filter changeover. |
| IC4 | Analog switch | NB changeover. |
| IC5 | Mixer | 455kHz and 8.375MHz. |
| D1~4 | Lighting surge protection | |
| D5 | Relay surge voltage absorption | |
| D6 | Switching | 8.83MHz filter changeover. |
| D7~26 | Switching | BPF changeover. (D16, 26 : TS-690 only) |
| D27~30 | Switching | AIP changeover. |
| D31,32 | Reverse current prevention | AIP control changeover. |
| D33 | Voltage regulator | 5.1V. |
| D34,35 | Reverse current prevention | Bias of TX mixer. |
| D36,37 | Switching | TX/RX changeover of VCO. |
| D38 | Reverse current prevention | For AGC. |
| D39 | Switching | On when RX. |
| D40~44 | Switching | 8.83MHz filter changeover. |
| D45 | Switching | On when TX. |
| D46~49 | Switching | 8.83MHz filter changeover. |
| D50 | Switching | On when TX. |
| D51 | Switching | On when RX. |
| D52 | Switching | 8.83MHz filter changeover. |

DESCRIPTION OF COMPONENTS

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|----------------------------|-----------------------------------|
| D53 | NB detection | For NB1 and NB2. |
| D54 | Switching | Speed up rise time of RBK. |
| D55 | Switching | 8.83MHz filter changeover. |
| D56 | Voltage regulator | 5.1V. |
| D57 | Switching | On when RX LO2 (64.22MHz) . |
| D58 | Switching | 8.83MHz filter changeover. |
| D59 | Switching | On when TX LO2 (64.22MHz). |
| D61,63 | Switching | On when AIP on. |
| D62,64 | Switching | On when AIP off. (TS-690 only) |
| D501 | LED for ON AIR | Active "H". |
| D502 | LED for AT TUNE | Active "H". |
| D503~511 | Reverse current prevention | |

FINAL UNIT (X45-3400-XX) : HF 100W -00 : TS-690S -01 : TS-450S

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|----------------------------------|--|
| Q1 | Pre-drive amplifier | Wide-band amplification of HF band. |
| Q2,3 | Drive amplifier | Push-pull wide-band amplification of HF band. |
| Q4,5 | Final amplifier | Push-pull wide-band amplification of HF band. |
| Q6 | Supply of bias for drive | Temperature compensation of drive. |
| Q7 | Supply of bias for final | Temperature compensation of final. |
| Q8 | Switching | For drive of fan motor when TXB "H". |
| IC1 | AVR | +8V of digital line. |
| IC2 | AVR | +5V. |
| IC3 | AVR | +8V of analog line. |
| D1 | Temperature compensation | Temperature detection of pre-drive. |
| D2 | Temperature compensation | Temperature detection of drive. |
| D3 | Temperature compensation | Temperature detection of final. |
| D4 | Surge absorption | For relay. (TS-690S only) |
| D5 | Surge absorption | For fan motor. |
| D6 | Protection of reverse connection | For power supply terminal. |
| D7,8 | Reverse current prevention | TS-690S only. |
| TH1 | Temperature detection of unit | 1/2 : High speed operation of fan motor. 2/2 : Power down. |

FINAL UNIT (X45-3420-00) : 50MHz 10W TS-690S ONLY

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|-------------------------------|-----------------------------------|
| Q1 | Drive amplifier of 50MHz band | |
| IC1 | Final amplifier of 50MHz band | |

FINAL UNIT (X45-3430-00) : 50MHz 50W TS-690S ONLY

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|-------------------------------|--|
| Q1,2 | Final amplifier of 50MHz band | Push-pull amplifier. |
| Q3 | Supply of bias for final | Temperature compensation of final. |
| Q4 | Switching | For drive of fan motor when TXB "H". |
| D1 | Temperature compensation | Temperature detection of final. |
| D2 | Surge absorption | For fan motor. |
| TH1 | Temperature detection of unit | 1/2 : High speed operation of fan motor. 2/2 : Power down. |

TS-450S/690S

DESCRIPTION OF COMPONENTS

DIGITAL UNIT (X46-312X-XX) 0-11 : TS-690S (K,P) 0-12 : TS-450S (K,P) 0-21 : TS-690S (X,M)

0-22 : TS-450S (X,M) 0-23 : TS-450S (M2) 2-71 : TS-690S (E) 2-72 : TS-450S (E) 2-73 : TS-690S (E2) 2-74 : TS-450S (E2)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|-----------------------|--|
| Q1 | Signal switching | Automatic transmission changeover. |
| Q2 | Signal switching | AT-300 control output (TS). |
| Q3 | Signal switching | AT-300 control output (TT). |
| Q4 | Signal switching | AT-300 control input (TS). |
| Q5 | Signal switching | AT-300 control input (TT). |
| Q6 | Signal switching | AT TUNE LED control. |
| C1 | CPU | 8 bit microprocessor. |
| C2 | ROM | 32K byte. |
| C3 | RAM | 8K byte. |
| C4 | Address latch | Separate from multiplexer address/data bus output. |
| C5 | Address decoder | Converts the address signal into a chip select signal for each IC. |
| C6,7 | I/O port | 8 bit x 4, 4 bit x 1, 36 ports. |
| C8 | Encoder gate array | Pulse count of encoder. |
| C9 | EEPROM | EEPROM (4096 bit) for memory of mainframe data. |
| C10 | System reset | Generate reset signal by power supply voltage. |
| C11 | Reverse logic OR gate | Chip select signal combination for RAM. |
| C12 | Buffer | Buffer of serial interface (ACC1). |
| C13,14 | Inverter | Shape waveform of reset signal. |
| C15,16 | Inverter | Click encoder shape wave. |
| D1,2 | Switching | Select back up power of RAM. |
| D3 | Protection diode | Protection input port from MIC UP switch. |
| D4 | Protection diode | Protection input port from MIC DOWN switch. |
| D5 | Diode for discharge | For discharge of reset voltage. |
| D6-13 | Protection diode | A/D converter input port protection. |
| D20-27 | Switching | Destination selection. |

IF UNIT (X48-3090-XX) -00 : TS-690S -01 : TS-450S

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|-------------------------------------|--|
| Q1 | Muting of reception | RBC. |
| Q2,3 | IF amplifier of reception | |
| Q4,6 | Switching | RXB except FM mode, changeover of 455kHz IF filter. |
| Q5 | Switching | RXB when FM mode, changeover of 455kHz IF filter. |
| Q7 | Muting of reception | FM, RBC. |
| Q8 | IF amplifier of reception | |
| Q9 | IF buffer of reception | AM detection, AFC, squelch. |
| Q10 | Buffer for AM detection | |
| Q11,12 | Switching | 14V when transmission. |
| Q13,14 | Gain down of reception | When 28MHz band. |
| Q15 | | |
| Q16,17 | Gain down of reception | When 50MHz band. (TS-690S only) |
| Q18 | Switching | During transmission of AM, SSB mode, changeover of 455kHz IF filter. |
| Q19 | Mode B | SSBB, CWB. |
| Q20 | Mode B | FMB, FSKB. |
| Q21 | Mode B | AMB, FMNB. |
| Q22 | Noise amplifier | |
| Q23 | FM detection output low-pass filter | De-emphasis. |
| Q24-27 | Squelch switching | |
| Q28 | Switching | Power on of Q29 when RDC is low (DSP when reception). |
| Q29 | Active low-pass filter | Low-pass filter of IF output for DSP-100. |
| Q30 | AF pre-amplifier | |
| Q31 | Muting of reception | Squelch, RBC, RBK. |

DESCRIPTION OF COMPONENTS

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|--------------------------------|--|
| Q32,33 | Amplifier for FM S-meter | |
| Q34,35 | Switching | 8V except FM mode (NFMB). |
| Q36 | AGC amplifier | |
| Q37 | Muting | Cut S-meter output during transmission. |
| Q38,39 | dB amplifier | Voltage of dB meter. |
| Q40 | Switching | Squelch. |
| Q41 | Switching | Packet squelch. |
| Q42 | Switching | ON/OFF of relay for external linear amplifier. |
| Q43 | Drive amplifier for modulation | |
| Q44,45 | Switching | 8V (NTDB) except DSP transmission mode. |
| Q46 | Switching | 8V (TDB) during DSP transmission mode. |
| Q47 | Muting | RLB line to the GND when power on. |
| Q48 | Switching | Delay timing of CKY when CW mode. |
| Q49 | Switching | Off when transmission inhibit. |
| Q50 | Switching | On when TXB. Send transmission signal to microprocessor. |
| Q51 | Switching | On when CW mode (changeover CW and without CW.) |
| Q52 | Switching | On when SS line is "L". |
| Q53 | Switching | On when PKS is "L". |
| Q54 | Switching | On when PKS is "L". (VOX line "L") |
| Q55 | Switching | On when VOX is "L". |
| Q56 | Switching | On when key down. |
| Q57 | Muting | On when reception. |
| Q58 | Switching | 8V when 50MHz band (50B). (TS-690S only) |
| Q59 | Switching | "FM-N" VR on. |
| Q60 | Mic amplifier | |
| Q61 | Switching | On when AM, FM, PROC. |
| Q62,63 | Switching | On when PROC. |
| Q64 | Muting | Packet, on when reception. |
| Q65 | Switching | 8V when packet (PPD). |
| Q66,67 | Switching | On when transmission power 10W (PD10 = 8V). |
| Q68 | Switching | "MIN" VR on. |
| Q69 | Switching | "50W" VR on. |
| Q70 | Switching | "10W" VR on. |
| Q71 | Switching | "50M 50W" VR on. (TS-690S only) |
| Q72 | Switching | Power supply for TU-8. |
| Q73 | VOX amplifier | |
| IC1 | Product detection | SSB, CW, FSK detection. |
| IC2 | Switching | Changeover for each mode of receiving audio signal. |
| IC3 | Serial data → decimal | Changeover of CWC, SSBC, FSKC, AMC, FMC, FM-NC, IF filter. |
| IC4 | FM IF stage, detection | |
| IC5 | AF power amplifier | |
| IC6 | Meter amplifier | S-meter, ALC meter. |
| IC7 | Switching | Changeover AGC, S-meter. |
| IC8 | Balanced modulator | SSB, AM modulation. |
| IC9 | Analog switch | CW, FM, FSK carrier output. |
| IC10 | Serial data → decimal | |
| IC11,12 | Switching | Timing. |
| IC13 | Analog switch | Mic amplifier output when DSP does not used. |
| IC14 | Analog switch | MA0 (DSP3 connector) output. |
| IC15 | Mic amplifier with ALC. | |
| IC16 | Amplifier | Transmission power control. |
| D1 | Switching | Changeover 455kHz IF filter (reception side). |
| D2 | switching | Changeover 455kHz IF filter (transmission side). |
| D3,4 | Switching | Changeover 455kHz IF filter (12kHz or 6kHz). |

DESCRIPTION OF COMPONENTS

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|----------------------------|--|
| D5,6 | Switching | Changeover 455kHz IF filter (2.4kHz). |
| D7,8 | Switching | Changeover 455kHz IF filter (500Hz). |
| D9 | Switching | Changeover 455kHz IF filter (reception side, except FM mode). |
| D10 | Switching | Changeover 455kHz IF filter (reception side, FM mode). |
| D11,12 | Switching | Changeover 455kHz IF filter (transmission side). |
| D13 | Switching | Changeover 455kHz IF filter (transmission side when transmitting for DSP use). |
| D14 | Reverse current prevention | FM, RBC. |
| D15 | AM detection | |
| D16,17 | Reverse current prevention | CKY. |
| D18 | Reverse current prevention | CW. |
| D19 | AVR | 5V. |
| D20 | Reverse current prevention | TXB. |
| D21 | Rectification | FM noise amplifier output. |
| D22 | Reverse current prevention | AM, SSB. |
| D23 | Reverse current prevention | SSB, CW. |
| D24 | Reverse current prevention | FSK. |
| D25 | Reverse current prevention | FM squelch signal. |
| D26 | Rectification | SSB squelch, AGC. |
| D27 | Reverse current prevention | FM. |
| D28 | Reverse current prevention | Squelch. |
| D29 | Reverse current prevention | RBC, ABK. |
| D30 | Rectification | FM S-meter voltage. |
| D31 | Rectification | dB meter voltage. |
| D32 | Spike absorption | |
| D33 | Reverse current prevention | Upset carrier balance during AM mode. |
| D34,35 | Switching | Carrier output. |
| D36 | Pin diode | Carrier level adjust. |
| D37 | Reverse current prevention | SSB. |
| D38 | Reverse current prevention | Carrier VR voltage. |
| D39 | Reverse current prevention | D34, 35 is on when Q43 is off in FSK mode. |
| D40 | Reverse current prevention | D34, 35 is on when Q43 is off in CW, SSB mode. |
| D41 | Reverse current prevention | |
| D42 | AVR | 5V. |
| D43,44 | Switching | Transmission inhibit when power on. |
| D45 | Switching | |
| D46 | Reverse current prevention | SS, VOX, KEY. |
| D47 | Reverse current prevention | TXB. |
| D48 | Reverse current prevention | CW, DELAY. |
| D49 | Reverse current prevention | SS. |
| D50 | Reverse current prevention | CW break-in. |
| D51 | Reverse current prevention | PKS. |
| D52,53 | Reverse current prevention | KEY. |
| D54 | Reverse current prevention | Transmission inhibit when power on (VOX on). |
| D55 | Reverse current prevention | AM,FM. |
| D56,57 | Reverse current prevention | |
| D58 | Reverse current prevention | PROC. |
| D59 | Reverse current prevention | |
| D60 | Rectification | Voltage for ALC. |
| D61 | Reverse current prevention | |
| D62 | Voltage shift | External ALC voltage. |
| D63 | Reverse current prevention | |
| D64,65 | AVR | |
| D66,67 | Reverse current prevention | |
| D69 | Reverse current prevention | ALC, S-meter voltage. |

TS-450S/690S

DESCRIPTION OF COMPONENTS

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|----------------------------|-----------------------------------|
| D71 | Reverse current prevention | 28MC. |
| D72 | Reverse current prevention | 50MC. (TS-690S only) |
| D73 | Reverse current prevention | |

PLL UNIT (X50-3150-XX) -00 : TS-690S -01 : TS-450S

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|-------------------|--|
| Q1 | OSC STD | Reference signal fstd 20MHz. |
| Q2 | Buffer | fstd. |
| Q3 | Buffer | 20MHz (CAR reference) output. |
| Q4 | Buffer | IC1 frequency divider input. |
| Q5 | Active LPF | 10kHz (DSP reference) output. |
| Q6 | Switching | VCO1-A changeover. |
| Q7 | Switching | VCO1-B changeover. |
| Q8 | Switching | VCO1-C changeover. |
| Q9 | Switching | VCO1-D changeover. (TS-690S only) |
| Q10 | VCO1-A | 73.08~83.55MHz. |
| Q11 | VCO1-B | 83.55~94.55MHz. |
| Q12 | VCO1-C | 94.55~113.05MHz. |
| Q13 | VCO1-D | 113.05~133.05MHz. (TS-690S only) |
| Q14 | Buffer | VCO1. |
| Q15 | Buffer | LO1 output 73.08~133.05MHz. |
| Q16 | Buffer | IC4 mixer input 73.08~133.05MHz. |
| Q17 | Buffer | PLL IC5 input 6~46MHz. |
| Q18 | Amplifier | PLL IC5 input 6~46MHz. |
| Q19~21 | Active LPF | Comparison 500kHz. |
| Q22 | Switching | "L" when unlock. |
| Q23 | Amplifier | LO2 output 64.22MHz. |
| Q24~26 | Active LPF | Comparison 20kHz (FM : 5kHz). |
| Q27,29 | Switching | PLL IF BPF changeover. (TS-690S only). |
| Q28 | Switching | On when IC4 mixer input 67.05~67.55MHz. (TS-690S only) |
| Q30 | Switching | On when IC4 mixer input 87.05~87.55MHz. (TS-690S only) |
| Q31 | Switching | VCO1 BPF frequency band changeover on when VCO1-A. |
| IC1,2 | Frequency divider | 1/4, 1/5, 1/10, 1/10. |
| IC3 | Mixer | 1 : 87.05~87.55MHz output. 2 : 67.05~67.55MHz input. 5 : 20MHz input. (TS-690S only) |
| IC4 | Mixer | 5 : 73.08~133.05MHz input. 11 : 67.05~67.55MHz or 87.05~87.55MHz input. 13 : 6~46MHz or 26.5~46MHz output. |
| IC5 | PLL | 2~4 : Frequency division ratio input. 5 : 5MHz input. 7 : PD output. 8 : UL output ("H" when UL). 14 : 6~46MHz or 26.5~46MHz input. |
| IC6 | PLL | 2~4 : Frequency division ratio input. 5 : 5MHz input. 7 : PD output. 8 : UL output ("H" when UL). 12 : 64.22MHz input. |
| IC7 | AVR | +8V (for PLL active LPF, for VCO2 module). |
| D1 | Vari-cap diode | VCO1-A. |
| D2 | Switching | VCO1-A output. |
| D3 | Vari-cap diode | VCO1-B. |
| D4 | Switching | VCO1-B output. |
| D5 | Vari-cap diode | VCO1-C. |
| D6 | Switching | VCO1-C output. |
| D7 | Vari-cap diode | VCO1-D. (TS-690S only) |
| D8 | Switching | VCO1-D output. (TS-690S only). |
| D9 | Switching | UL signal. |
| D10 | Vari-cap diode | VCO1-C. |
| D11,12 | Switching | On when IC4 mixer input 67.05~67.55MHz. (TS-690S only) |
| D13,14 | Switching | On when IC4 mixer input 87.05~87.55MHz. (TS-690S only) |

DESCRIPTION OF COMPONENTS

CAR UNIT (X50-3160-00)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|--------------|-----------------------------------|
| Q1 | Amplifier | fstd 20MHz. |
| Q2 | Buffer | D/A buffer (DDS1). |
| Q3 | Buffer | D/A buffer (DDS2). |
| Q4 | Buffer | CAR output 455kHz. |
| Q5 | Buffer | IC4 mixer input 8.375MHz. |
| Q6 | Amplifier | Triplcation 60MHz. |
| Q7 | OSC | LO3 signal 8.375MHz. |
| Q8 | Buffer | LO3 output 8.375MHz. |
| Q9 | Buffer | DLO output 67.05~67.55MHz. |
| IC1 | DDS | DLO 1.325~0.825MHz. |
| IC2 | DDS | CAR, FSK modulation 455kHz. |
| IC3 | Buffer | Inverter fstd. |
| D1 | Switching | RTK. |

FILTER UNIT (X51-3110-XX)

-00 : TS-690S (K,X,P,E,E2) -01 : TS-450S (K,X,P,E,E2) -21 : TS-690S (M) -22 : TS-450S (M,M2)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|------------------------------|--|
| Q1 | Relay driver | 21.5~30.5MHz LPF relay. |
| Q2 | Relay driver | 25.0~30.5MHz AT coil tap relay. |
| IC1 | Band data decoder | |
| IC2 | Relay driver | |
| D1 | Surge absorption | 0.3~2.5MHz LPF relay. |
| D2 | Surge absorption | 2.5~4.0MHz LPF relay. |
| D3 | Surge absorption | 4.0~7.5MHz LPF relay. |
| D4 | Surge absorption | 7.5~10.5MHz LPF relay. (M,M2 only) |
| D5 | Surge absorption | 10.5~14.5MHz LPF relay. |
| D6 | Surge absorption | 14.5~21.5MHz LPF relay. |
| D7 | Surge absorption | 21.5~30.5MHz LPF relay. |
| D8 | Surge absorption | 30.5~60MHz LPF relay. (TS-690S only) |
| D9 | High frequency rectification | Reflected wave rectification. |
| D10 | High frequency rectification | Forward wave rectification. |
| D11 | Lightning surge absorption | For ANT1 (HF/50MHz band). |
| D12 | Lightning surge absorption | For ANT2 (50MHz band). (TS-690S only). |
| D13 | Surge absorption | TX/RX changeover relay. |
| D14 | Surge absorption | ANT1/ANT2 changeover relay. (TS-690S only) |
| D15 | Voltage stabilization | +5V stabilization. |
| D16 | Reverse current prevention | |
| D17,18 | Reverse current prevention | (Except M,M2) |

AT UNIT/AT-450 (X53-3370-00)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|---------------|-------------------------------------|
| Q1,2 | Amplifier | Waveform shaping. |
| Q3 | Switching | On when APRE "H". |
| Q4,5 | Switching | Motor speed control pulse. |
| Q6 | Switching | K1 relay changeover. |
| IC1 | D-FF | Phase difference detection |
| IC2 | Analog switch | For control changeover motor 1. |
| IC3 | Analog switch | For control changeover motor 2. |
| IC4 | Motor drive | For motor 1. |
| IC5 | Motor drive | For motor 2. |
| IC6 | Comparator | Amplification difference detection. |

TS-450S/690S

DESCRIPTION OF COMPONENTS

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|--------------|--|
| D1 | Detection | Current component amplification detection. |
| D2 | Detection | Voltage component amplification detection. |
| D3~8 | Switching | Clipper. |
| D9 | Switching | Spike absorption. |
| D101~106 | Switching | Spike absorption. |

VCO2 (X58-3390-03)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|-----------------------|-----------------------------------|
| Q1 | VCO0 (PLL0) | 64.22MHz |
| Q2 | VCO0 buffer | |
| D1 | VCO0 frequency viable | |

SIDE TONE (X59-1060-00)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|-------------------------------|-----------------------------------|
| Q1 | SIDE TONE oscillation | 800Hz. |
| D1 | Switching | Turned ON when KEY DOWN. |
| D2 | Prevention of reverse current | |
| D3 | Temperature compensation | |

VOX (X59-1080-00)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|-----------|-------------------------------|-----------------------------------|
| IC1 (1/2) | Comparison of VOX level | |
| IC1 (2/2) | Comparison of ANTI VOX level | |
| IC2 | NOR circuit (RS flip-flop) | |
| Q1 | Switching transistor | Q1 is ON when IC2/11pin is "H" |
| D1,2 | Prevention of reverse current | |

FM MIC AMP (X59-3000-03)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|-----------|--------------------|-----------------------------------|
| IC1 (1/2) | Low-pass filter | 1,2 : Output |
| IC1 (2/2) | Limiting amplifier | 6 : Input 7 : Output |
| Q1 | SUB TONE | |

NOTCH (X59-3030-00)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|---|-----------------------------------|
| IC1 | Active BPF NOTCH gain compensation amplifier | |

NB2 (X59-3350-00)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|-------------------------|--|
| IC1 | One-shot multi vibrator | Synchronized to pulse, with width of 1/4,4/4 : 5mS and 2/4,3/4 : 40mS. |
| Q1 | Switching transistor | Turned ON when pulse is 15mS. |
| Q2 | Switching transistor | Turned OFF when pulse is 40mS. |

DESCRIPTION OF COMPONENTS

TRX (X59-3680-01)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|--------------|-----------------------------------|
| Q151 | Switching | Receive voltage supply. |
| Q152 | Switching | Transmitter voltage supply. |
| Q153 | Switching | Transmitter. |
| Q154,155 | Switching | Receive. |

SELECT (X59-3920-00)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|---------------|---|
| IC1 | Analog switch | Changeover of notch, flat signal, changeover AF signal for DSP. |

BK-IN (X59-3930-00)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|----------------------------|-----------------------------------|
| Q1 | Switching | Time constant changeover when CW. |
| IC1 | Inverter | |
| IC2 | NAND | RBC. |
| IC3 | NAND | CKY. |
| D1 | Discharge | Discharge of C1. |
| D2 | Discharge | Discharge of C3. |
| D3 | Reverse current prevention | |

METER (X59-3940-00)

| Ref. No. | Use/Function | Operation/Condition/Compatibility |
|----------|----------------------------|-----------------------------------|
| IC1 | Amplifier | For VSF, VSR. |
| D1,2 | Reverse current prevention | |

TS-450S/690S

PARTS LIST

* New Parts

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TS-450S/690S

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|--------------------------------|------------------------|--------------------|
| TS-450S/690S | | | | | | |
| 1 | 1B | * | A01-2028-02 | METALLIC CABINET(TOP) | | |
| 2 | 3B | * | A01-2029-02 | METALLIC CABINET(BOTTOM) | | |
| 4 | 3B | | A40-0630-13 | BOTTOM PLATE | | |
| 10 | 2G | * | A62-0102-03 | PANEL | 450S | |
| 10 | 2G | * | A62-0109-03 | PANEL | 690S | |
| 14 | 2G | * | A62-0099-02 | PANEL ASSY | 450S | |
| 14 | 2G | * | A62-0106-02 | PANEL ASSY | 690S | |
| 22 | 3D | * | A82-0004-04 | REAR PANEL | 450/AT | |
| 23 | 2G | * | B10-1167-13 | FRONT GLASS | | |
| 24 | 2H | | B11-0466-04 | FILTER | | |
| 25 | 1I | * | B38-0361-05 | LCD ASSY | | |
| - | - | | B42-1729-04 | LABEL(WITH AT) | 450/AT | |
| 27 | 3B | | B42-3343-04 | LABEL(S/NO) | | |
| 28 | 2F | * | B42-3464-04 | LABEL(REAR) | | |
| 29 | 2J | * | B42-3465-04 | LABEL | | |
| 30 | 3O | * | B44-2163-04 | LABEL(UPC CORD) | | |
| 34 | 1P | | B46-0410-30 | WARRANTY CARD | K | |
| 34 | 1P | | B46-0419-00 | WARRANTY CARD | EE2 | |
| 34 | 1P | | B46-0422-00 | WARRANTY CARD | P | |
| 37 | 1P | * | B62-0095-00 | INSTRUCTION MANUAL | KX | |
| 37 | 1P | * | B62-0096-00 | INSTRUCTION MANUAL | MM2P | |
| 37 | 1P | * | B62-0096-00 | INSTRUCTION MANUAL | EE2 | |
| 37 | 1P | * | B62-0097-00 | INSTRUCTION MANUAL | EE2 | |
| 40 | 3B | * | B72-0352-04 | MODEL NAME PLATE (690S) | K | |
| 38 | 1P | * | B62-0099-00 | INSTRUCTION MANUAL(COMMAND) | | |
| 40 | 3B | * | B72-0178-04 | MODEL NAME PLATE (450S/AT) | XPEE2MM2 | |
| 40 | 3B | * | B72-0182-04 | MODEL NAME PLATE (690S) | XPEE2M | |
| 40 | 3B | * | B72-0353-04 | MODEL NAME PLATE (450S/AT) | K | |
| 48 | 1K | | E04-0167-05 | RF COAXIAL CABLE RECEPTACLE | | |
| 49 | 1O | | E07-0751-05 | 7P DIN PLUG ASSY (ACSY) | | |
| 50 | 1O | | E07-1351-05 | 13P ROUND PLUG ASSY(ACSY) | | |
| 51 | 1K | * | E23-0677-04 | GND TERMINAL | | |
| 52 | 1O | | E30-3035-05 | DC CABLE | | |
| 54 | 1O | | E31-2154-05 | CONNECTING WIRE(CAL) | | |
| - | - | | E31-3301-05 | CONNECTING WIRE | | |
| - | - | | E31-6066-05 | FLAT CABLE | | |
| - | - | | E37-0234-05 | FLAT CABLE | | |
| - | - | * | E33-1951-35 | FINISHED WIRE SET | | |
| - | - | * | E37-0193-05 | FLAT CABLE (PLL-GIG) | | |
| - | - | * | E37-0194-05 | FLAT CABLE (RF/SW-DIG) | | |
| - | - | * | E37-0195-05 | FLAT CABLE (DIS-DIG,RF-DIG) | | |
| - | - | * | E37-0196-05 | CONNECTING WIRE (PLL-RF/L01) | | |
| - | - | * | E37-0197-05 | CONNECTING WIRE (PLL-RF/L02) | | |
| - | - | * | E37-0198-05 | CONNECTING WIRE (CAR-PLL/20M) | | |
| - | - | * | E37-0199-15 | CONNECTING WIRE (PLL/8-CAR/5) | | |
| - | - | * | E37-0200-05 | CONNECTING WIRE (50M 10W/690S) | | |
| - | - | * | E37-0208-05 | FLAT CABLE (RF-IF) | | |
| - | - | * | E37-0225-05 | CONNECTING WIRE (CAR-PLL/DL0) | | |
| - | - | * | E37-0227-05 | CONNECTING WIRE (RF-FILTER) | | |
| 77 | 1O | | F06-4029-05 | FUSE (4A ACSY) | | |
| 80 | 1F | * | F09-0429-05 | FAN (HF) | | |
| 81 | 2B | * | F10-1490-03 | SHIELDING PLATE (FILTER) | 450S | |
| 81 | 2B | * | F10-1492-03 | SHIELDING PLATE (FILTER) | 690S | |
| 82 | 1E | * | F10-1491-02 | SHIELDING PLATE (FINAL) | 450S | |

L:Scandinavia

K:USA

P:Canada

Y:PX(Far East, Hawaii)

T:England

E:Europe

Y:AAFES(Europe)

X:Australia

M:Other Areas

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

△ indicates safety critical components

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TS-450S/690S

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|-----------------|---------------|-------------------|-------------------|--------------------------------|-------------------------|--------------------|
| 83 | 2K | * | F10-1493-02 | SHIELDING PLATE (FINAL) | 690S | |
| 84 | 1E | * | F10-1494-03 | SHIELDING PLATE (PLL) | | |
| 85 | 1E | * | F10-1495-03 | SHIELDING PLATE (CAR) | | |
| 86 | 3K | * | F10-1496-03 | SHIELDING PLATE (10W 50M) | 690S | |
| 87 | 1F | * | F10-2011-03 | SHIELDING PLATE (FAN) | | |
| 88 | 1K | * | F20-1071-04 | INSULATING BOARD (FILTER) | | |
| - | | | F51-0011-05 | FUSE (6X30MM) (25A) | | |
| 90 | 1Q | | F51-0011-05 | FUSE (6X30MM) (25A ACSY) | | |
| 92 | 3A | | G02-0505-05 | SPRING | | |
| 93 | 1A | | G10-0656-04 | NON-WOVEN FABRIC (SP) | | |
| - | | | G11-0609-04 | CUSHION | | |
| 95 | 3E | | G13-0831-04 | CUSHION (TU-8) | | |
| - | | | G13-0855-04 | CUSHION | | |
| 97 | 1G | * | G13-1321-04 | CUSHION (KNØB) | | |
| 98 | 2H | * | G13-1322-04 | CUSHION (KNØB) | | |
| 99 | 1A | * | G13-1323-14 | CUSHION (SP) | | |
| 100 | 2Q | * | H10-2727-02 | POLYSTYRENE FOAMED FIXTURE (F) | | |
| 101 | 2P | * | H10-2728-02 | POLYSTYRENE FOAMED FIXTURE (R) | | |
| 102 | 1P | | H12-1315-04 | PACKING FIXTURE | | |
| - | | | H13-0860-04 | PROTECTION BOARD | | |
| 103 | 2P | * | H20-1440-03 | PROTECTION COVER | | |
| 104 | 1Q | | H25-0079-04 | PROTECTION BAG | KPMM2X | |
| 105 | 1Q | | H25-0112-04 | PROTECTION BAG (DC CABLE) | | |
| 106 | 1Q | | H25-0029-04 | PROTECTION BAG | | |
| 110 | 3Q | * | H52-0121-04 | ITEM CARTON BOX (450SAT) | KXPMM2 | |
| 110 | 3Q | * | H52-0125-04 | ITEM CARTON BOX (450S) | KXPMM2 | |
| 110 | 3Q | * | H52-0129-04 | ITEM CARTON BOX (690S) | KXPM | |
| 110 | 3Q | * | H52-0209-04 | ITEM CARTON BOX (450SAT) | E, E2 | |
| 110 | 3Q | * | H52-0210-04 | ITEM CARTON BOX (450S) | E, E2 | |
| 110 | 3Q | * | H52-0211-04 | ITEM CARTON BOX (690S) | E, E2 | |
| 111 | 3P | * | H62-0107-04 | OUTER PACKING CASE (450SAT) | KXPMM2 | |
| 111 | 3P | * | H62-0108-04 | OUTER PACKING CASE (450S) | KXPMM2 | |
| 111 | 3P | * | H62-0109-04 | OUTER PACKING CASE (690S) | KXPM | |
| 111 | 3P | * | H62-0181-04 | OUTER PACKING CASE (450SAT) | E, E2 | |
| 111 | 3P | * | H62-0182-04 | OUTER PACKING CASE (450S) | E, E2 | |
| 111 | 3P | * | H62-0183-04 | OUTER PACKING CASE (690S) | E, E2 | |
| 114 | 3B | | J02-0323-05 | FOOT (R) | | |
| 115 | 3A | | J02-0440-04 | FOOT (SUB) | | |
| 116 | 1A | | J02-0441-05 | FOOT (SMALL) | | |
| 117 | 3A | | J02-0442-04 | FOOT (F) | | |
| - | | | J13-0414-05 | FUSE HOLDER | | |
| 121 | 3A, 3B | | J21-4208-04 | MOUNTING HARDWARE (SUB-FOOT) | | |
| 122 | 2H | | J31-0141-04 | COLLAR (MIC) | | |
| - | | | J61-0307-05 | WIRE BAND | | |
| 124 | 1B | | K01-0416-05 | HANDLE | | |
| 126 | 3A | * | K21-0791-02 | KNØB (MAIN) | | |
| 127 | 1Q | | K23-0712-04 | KNØB (VOX, ACSY) | | |
| 130 | 2G | | K29-3173-04 | KNØB (BUTTON) | | |
| 131 | 2G | | K29-4505-04 | KNØB (BUTTON) (M. IN) | | |
| 132 | 2G | | K29-4506-04 | KNØB (BUTTON) (M. VFO) | | |
| 133 | 2G | | K29-4507-04 | KNØB (BUTTON) (SCAN) | | |
| 134 | 2G | | K29-4508-04 | KNØB (BUTTON) (DOWN) | | |
| 135 | 2G | | K29-4509-04 | KNØB (BUTTON) (UP) | | |
| 136 | 3A | | K29-4515-04 | KNØB (INSIDE) | | |

L: Scandinavia

K: USA

P: Canada

TS-450S: K, X, P, E, E2, M, M2

Y: PX (Far East, Hawaii)

T: England

E: Europe

TS-690S: K, X, P, E, E2, M

Y: AAFES (Europe)

X: Australia

M: Other Areas

⚠ indicates safety critical components.

TS-450S/690S

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|------------------|---------------|-------------------|-------------------|--------------------------------|------------------------|--------------------|
| 137 | 3A | | K29-4516-04 | KNOB (OUTSIDE) | | |
| 138 | 2G | | K29-4611-03 | KNOB(BUTTON) (1) | | |
| 139 | 2G | | K29-4612-03 | KNOB(BUTTON) (2) | | |
| 140 | 2G | | K29-4613-03 | KNOB(BUTTON) (3) | | |
| 141 | 2G | | K29-4614-03 | KNOB(BUTTON) (4) | | |
| 142 | 2G | | K29-4615-03 | KNOB(BUTTON) (5) | | |
| 143 | 2G | | K29-4616-03 | KNOB(BUTTON) (6) | | |
| 144 | 2G | | K29-4617-03 | KNOB(BUTTON) (7) | | |
| 145 | 2G | | K29-4618-03 | KNOB(BUTTON) (8) | | |
| 146 | 2G | | K29-4619-03 | KNOB(BUTTON) (9) | | |
| 147 | 2G | | K29-4620-03 | KNOB(BUTTON) (0) | | |
| 148 | 2G | | K29-4621-03 | KNOB(BUTTON) (CLR) | | |
| 149 | 2G | | K29-4622-03 | KNOB(BUTTON) (ENT) | | |
| 150 | 2G | | K29-4626-03 | KNOB(BUTTON) (VOICE) | | |
| 151 | 2G | | K29-4630-03 | KNOB(BUTTON) (F.LOCK) | | |
| 152 | 2G | | K29-4633-03 | KNOB(BUTTON) (LSB/USB) | | |
| 153 | 2G | | K29-4634-03 | KNOB(BUTTON) (CW/FSK) | | |
| 154 | 2G | | K29-4635-03 | KNOB(BUTTON) (FM/AM) | | |
| 155 | 2A | | K29-4636-04 | KNOB (POWER) | | |
| 156 | 3A | | K29-4682-14 | KNOB (MIC ETC.) | | |
| 157 | 1G | * | K29-4688-04 | KNOB (SEND/REC) | | |
| 158 | 2G | * | K29-4689-03 | KNOB(BUTTON) (TF/SET) | | |
| 159 | 2G | * | K29-4690-03 | KNOB(BUTTON) (M/V) | | |
| 160 | 2G | * | K29-4691-03 | KNOB(BUTTON) (RIT) | | |
| 161 | 2G | * | K29-4692-03 | KNOB(BUTTON) (XIT) | | |
| 162 | 2G | * | K29-4693-03 | KNOB(BUTTON) (A/B) | | |
| 163 | 2G | * | K29-4694-03 | KNOB(BUTTON) (SPLIT) | | |
| 164 | 2G | * | K29-4695-03 | KNOB(BUTTON) (A=B) | | |
| 165 | 2G | * | K29-4696-03 | KNOB(BUTTON) (1MHZ) | | |
| 166 | 3G | * | K29-4697-14 | KNOB (M.CH) | | |
| 167 | 2A | * | K29-4714-08 | KNOB RING (MAIN) | | |
| A | 3K | * | N09-0623-05 | SCREW (50M MODULE) | 690S | |
| B | 2E, 3E | | N09-2051-05 | SCREW (DIG) | X | |
| C | 2K | | N15-1040-46 | FLAT WASHER (GND) | | |
| D | 2G | | N19-0637-04 | FLAT WASHER (PANEL) | | |
| E | 1H, 1I | | N32-2604-46 | FLAT HEAD MACHINE SCREW | | |
| F | 1H, 1I | | N32-2606-46 | FLAT HEAD MACHINE SCREW | | |
| G | 2C, 3C | | N32-3005-46 | FLAT HEAD MACHINE SCREW(SUB-PA | | |
| H | 1H | | N32-3016-46 | FLAT HEAD MACHINE SCREW(POW.SW | | |
| I | 1A | | N33-3006-41 | OVAL HEAD MACHINE SCREW(CABINE | | |
| J | 1F | | N35-3004-46 | BINDING HEAD MACHINE SCREW(FAN | | |
| K | 1F, 2M | | N35-3018-46 | BINDING HEAD MACHINE SCREW(FAN | | |
| L | 2K | | N35-4010-46 | BINDING HEAD MACHINE SCREW(GND | | |
| M | 1E | | N87-2606-46 | BRAZIER HEAD TAPTITE SCREW | | |
| N | 1A, 1J | | N87-3006-46 | BRAZIER HEAD TAPTITE SCREW | | |
| O | 3A, 2D | | N87-3008-46 | BRAZIER HEAD TAPTITE SCREW | | |
| P | 2F | | N88-3006-46 | FLAT HEAD TAPTITE SCREW(AT UNI | | |
| Q | 1B | | N89-3006-45 | BINDING HEAD TAPTITE SCREW(FIL | | |
| R | 2A | | N90-3008-46 | TP HEAD MACHINE SCREW(PANEL) | | |
| 170 | 1H | | S40-2460-05 | PUSH SWITCH (POWER) | | |
| - | | | S50-1406-05 | TACT SWITCH | | |
| 175 | 2A | | T07-0252-15 | SPEAKER | | |
| 180 | 1G | | T91-0352-15 | MICROPHONE | | |

L:Scandinavia

K:USA

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TS-450S : K,X,P,E,E2,M,M2

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TS-690S : K,X,P,E,E2,M

Y:AAFES(Europe)

X:Australia

M:Other Areas

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PARTS LIST

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TS-450S/690S
SWITCH UNIT (X41-3170-00)
RF UNIT (X44-3130-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|---|---------------|-------------------|-------------------|---------------------------------|------------------------|--------------------|
| IC1 ,2 | | | LC7582 | IC(LCD DRIVER) (LCD ASSY) | | |
| 185 | 1E | | W02-0855-05 | ENCODER | | |
| 200 | 2H, 3I | * | X41-3170-00 | SWITCH UNIT | 690S | |
| 201 | 3F, 1H | * | X44-3130-00 | RF UNIT | 450S | |
| 201 | 3F, 1H | * | X44-3130-01 | RF UNIT | 690S | |
| 203 | 2K | * | X45-3400-00 | FINAL UNIT | 450S | |
| 203 | 2K | * | X45-3400-01 | FINAL UNIT | | |
| 205 | 3K | * | X45-3420-00 | FINAL UNIT/50M 10W | 690S | |
| 206 | 2D | * | X45-3430-00 | FINAL UNIT/50M 25,50W | 690S | |
| 208 | 2E | * | X46-3120-11 | DIGITAL UNIT (690S) | KP | |
| 208 | 2E | * | X46-3120-12 | DIGITAL UNIT (450S) | KP | |
| 208 | 2E | * | X46-3120-21 | DIGITAL UNIT (690S) | MX | |
| 208 | 2E | * | X46-3120-22 | DIGITAL UNIT (450S) | MX | |
| 208 | 2E | * | X46-3120-23 | DIGITAL UNIT (450S) | M2 | |
| 208 | 2E | * | X46-3122-71 | DIGITAL UNIT (690S) | E | |
| 208 | 2E | * | X46-3122-72 | DIGITAL UNIT (450S) | E | |
| 208 | 2E | * | X46-3122-73 | DIGITAL UNIT (690S) | E2 | |
| 208 | 2E | * | X46-3122-74 | DIGITAL UNIT (450S) | E2 | |
| 209 | 3E | * | X48-3090-00 | IF UNIT | 690S | |
| 209 | 3E | * | X48-3090-01 | IF UNIT | 450S | |
| 210 | 2E | * | X50-3150-00 | PLL UNIT | 690S | |
| 210 | 2E | * | X50-3150-01 | PLL UNIT | 450S | |
| 211 | 1E | * | X50-3160-00 | CAR UNIT | | |
| 212 | 1J | * | X51-3110-00 | FILTER UNIT (690S) | KXPBEE2 | |
| 212 | 1J | * | X51-3110-01 | FILTER UNIT (450S) | KXPBEE2 | |
| 212 | 1J | * | X51-3110-21 | FILTER UNIT (690S) | M | |
| 212 | 1J | * | X51-3110-22 | FILTER UNIT (450S) | MM2 | |
| 215 | 2L | * | X53-3370-00 | AT UNIT (450SAT) | | |
| SWITCH UNIT (X41-3170-00) | | | | | | |
| CN1 | | | E40-3300-05 | PIN ASSY (3P) | | |
| CN2 | | | E40-3303-05 | PIN ASSY (6P) | | |
| CN3 | | | E40-3306-05 | PIN ASSY (9P) | | |
| CN4 | | * | E40-3305-05 | PIN ASSY (8P) | | |
| CN5 ,6 | | | E40-3300-05 | PIN ASSY (3P) | | |
| CN7 | | | E40-3299-05 | PIN ASSY (2P) | | |
| J1 | | | E11-0437-05 | PHONE JACK (PHONE) | | |
| R1 ,2 | | | RD14CB2E101J | RD 100 J 1/4W | | |
| VR1 | | * | R24-1402-05 | POTENTIOMETER (NOTCH/SQ) | | |
| VR2 | | * | R19-3433-05 | POTENTIOMETER (AF/RF) | | |
| VR3 | | * | R05-3462-05 | POTENTIOMETER (MIC) | | |
| VR4 | | * | R05-2404-05 | POTENTIOMETER (PWR) | | |
| VR5 | | * | R05-3463-05 | POTENTIOMETER (CAR) | | |
| VR6 | | * | R05-6403-05 | POTENTIOMETER (DELAY) | | |
| VR7 | | * | R19-3434-05 | POTENTIOMETER (RIT/XIT, IF SET) | | |
| S1 | | * | W02-1687-05 | ENCODER (SUB) | | |
| RF UNIT (X44-3130-XX) -00 : TS-690S -01 : TS-450S | | | | | | |
| C1 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C2 | | | CC73FCH1H470J | CHIP C 47PF J | | |
| C3 | | | CC73FCH1H150J | CHIP C 15PF J | | |
| C4 | | | CC73FCH1H820J | CHIP C 82PF J | | |
| C5 | | | CC73FCH1H560J | CHIP C 56PF J | | |

L:Scandinavia K:USA P:Canada
Y:PX(Far East, Hawaii) T:England E:Europe
Y:AAFES(Europe) X:Australia M:Other Areas

TS-450S : K,X,P,E,E2,M,M2
TS-690S : K,X,P,E,E2,M

 indicates safety critical components

TS-450S/690S

PARTS LIST

× New Parts

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RF UNIT (X44-3130-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C6 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C7 , 8 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C9 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C10 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C11 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C12 | | | CK73FB1E223K | CHIP C 0.022UF K | | |
| C13 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C14 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C15 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C16 | | | CK73FB1H222K | CHIP C 2200PF K | | |
| C17 | | | CK73FB1H682K | CHIP C 6800PF K | | |
| C18 | | | CK73FB1H222K | CHIP C 2200PF K | | |
| C19 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C20 , 21 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C22 | | | CK73FB1H472K | CHIP C 4700PF K | | |
| C23 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C24 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C25 | | | CC73FSL1H821J | CHIP C 820PF J | | |
| C26 | | | CK73FB1H472K | CHIP C 4700PF K | | |
| C27 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C28 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C29 , 30 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C31 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C32 | | | CK73FB1H222K | CHIP C 2200PF K | | |
| C33 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C34 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C35 | | | CC73FSL1H471J | CHIP C 47PF J | | |
| C36 | | | CK73FB1H222K | CHIP C 2200PF K | | |
| C37 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C38 , 39 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C40 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C41 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C42 | | | CC73FSL1H331J | CHIP C 330PF J | | |
| C43 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C44 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C45 , 46 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C47 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C48 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C49 | | | CC73FSL1H121J | CHIP C 120PF J | | |
| C50 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C51 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C52 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C53 | | | CC73FSL1H821J | CHIP C 820PF J | | |
| C54 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C55 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C56 | | | CC73FCH1H820J | CHIP C 82PF J | | |
| C57 | | | CC73FSL1H821J | CHIP C 820PF J | | |
| C58 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C59 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C60 | | | CC73FSL1H391J | CHIP C 390PF J | | |
| C61 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C62 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C63 | | | CC73FCH1H820J | CHIP C 82PF J | | |
| C64 | | | CC73FSL1H271J | CHIP C 270PF J | | |
| C65 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |

L:Scandinavia

K:USA

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M:Other Areas

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

△ indicates safety critical components

PARTS LIST

* New Parts

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RF UNIT (X44-3130-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕 向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-------------------------|-------------------------|--------------------|
| C66 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C67 | | | CC73FSL1H221J | CHIP C 220PF J | | |
| C68 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C69 | | | CC73FCH1H680J | CHIP C 68PF J | | |
| C70 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C71 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C72 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C73 | | | CC73FCH1H220J | CHIP C 22PF J | | |
| C74 | | | CK73FB1H222K | CHIP C 2200PF K | | |
| C75 , 76 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C77 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C78 , 79 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C80 | | | CC73FSL1H151J | CHIP C 150PF J | 690S | |
| C81 | | | CK73FF1E104Z | CHIP C 0.1UF Z | 690S | |
| C82 | | | CK73FB1H102K | CHIP C 1000PF K | 690S | |
| C83 | | | CC73FCH1H270J | CHIP C 27PF J | 690S | |
| C84 | | | CK73FF1E104Z | CHIP C 0.1UF Z | 690S | |
| C85 | | | CK73FB1H102K | CHIP C 1000PF K | 690S | |
| C86 | | | CC73FCH1H120J | CHIP C 12PF J | 690S | |
| C87 | | | CK73FB1H102K | CHIP C 1000PF K | 690S | |
| C88 | | | CK73FF1E104Z | CHIP C 0.1UF Z | 690S | |
| C89 | | | CC73FCH1H270J | CHIP C 27PF J | 690S | |
| C90 , 91 | | | CK73FB1H182K | CHIP C 1800PF K | | |
| C92 | | | CK73FB1H472K | CHIP C 4700PF K | | |
| C93 | | | CK73FB1H102K | CHIP C 1000PF K | 690S | |
| C94 , 95 | | | CK73FF1E104Z | CHIP C 0.1UF Z | 690S | |
| C96 | | | CC73FCH1H820J | CHIP C 82PF J | | |
| C97 , 98 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C99 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C100 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C101 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C102 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C103 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C104 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C105 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C106 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C107 | | | CC73FCH1H101J | CHIP C 100PF J | | |
| C108 | | | CC73FCH1H150J | CHIP C 15PF J | | |
| C109 | | | CC73FCH1H820J | CHIP C 82PF J | | |
| C110 | | | CC73FCH1H470J | CHIP C 47PF J | | |
| C111 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C112-114 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C115 | | | CC73FCH1H180J | CHIP C 18PF J | | |
| C116 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C117 | | | CC73FCH1H020C | CHIP C 2.0PF C | | |
| C118, 119 | | | CC73FCH1H010C | CHIP C 1PF C | | |
| C120 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C121 | | | CC73FSL1H471J | CHIP C 470PF J | | |
| C122 | | | CE04EW1C220M | ELECTR 22UF 16WV | | |
| C123-127 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C128 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C129 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C130 | | | CC73FCH1H010C | CHIP C 1PF C | | |
| C131 | | | CC73FCH1H0R5C | CHIP C 0.5PF C | | |
| C132 | | | CC73FCH1H060D | CHIP C 6PF D | | |

L:Scandinavia

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TS-450S/690S

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RF UNIT (X44-3130-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|---|---------------|-------------------|---|---|------------------------|--------------------|
| C133, 134 C135 C136 C137, 138 C139 | | | CC73FCH1H050D CC73FCH1H0R5C CC73FCH1H020C CK73FF1E104Z CK73FB1H102K | CHIP C 5.0PF D CHIP C 0.5PF C CHIP C 2.0PF C CHIP C 0.1UF Z CHIP C 1000PF K | | |
| C140 C141, 142 C143-145 C146-148 C149 | | | CE04EW1E4R7M CK73FB1H102K CK73FF1E104Z CC73FCH1H0R5C CK73FF1E104Z | ELECTR0 4.7UF 25WV CHIP C 1000PF K CHIP C 0.1UF Z CHIP C 0.5PF C CHIP C 0.1UF Z | | |
| C150-154 C155 C156, 157 C158 C159 | | | CK73FB1H102K CE04EW1E470M CK73FB1H102K CK73FB1H472K CK73FB1H102K | CHIP C 1000PF K ELECTR0 47UF 25WV CHIP C 1000PF K CHIP C 4700PF K CHIP C 1000PF K | | |
| C160 C161, 162 C163 C164 C165, 166 | | | CK73FB1H472K CK73FF1E104Z CK73FB1H102K CK73FF1E104Z CK73FB1E103K | CHIP C 4700PF K CHIP C 0.1UF Z CHIP C 1000PF K CHIP C 0.1UF Z CHIP C 0.01UF K | | |
| C167 C168-173 C174 C175 C176 | | | CK73FB1H102K CK73FB1E103K CK73FB1E223K CK73FB1H102K CK73FB1E103K | CHIP C 1000PF K CHIP C 0.01UF K CHIP C 0.022UF K CHIP C 1000PF K CHIP C 0.01UF K | | |
| C177 C178 C179 C180-181 C182-191 | | | CK73FB1H102K CK73FB1E103K CC73FCH1H150J CK73FB1E103K CK73FB1E103K | CHIP C 1000PF K CHIP C 0.01UF K CHIP C 15PF J CHIP C 0.01UF K CHIP C 0.01UF K | | |
| C192-195 C196 C197 C198 C199-201 | | | CK73FB1H102K CK73FF1E104Z CE04EW1C100M CK73FB1E103K CK73FB1H102K | CHIP C 1000PF K CHIP C 0.1UF Z ELECTR0 10UF 16WV CHIP C 0.01UF K CHIP C 1000PF K | | |
| C202 C203 C204 C205 C206 | | | CE04EW1A101M CK73FF1E104Z CC73FCH1H100D CK73FB1E103K CK73FF1E104Z | ELECTR0 100UF 10WV CHIP C 0.1UF Z CHIP C 10PF D CHIP C 0.01UF K CHIP C 0.1UF Z | | |
| C207 C208 C209 C210 C211 | | | CC73FCH1H220J CK73FB1E103K CC73FCH1H220J CK73FB1E103K CE04EW1H010M | CHIP C 22PF J CHIP C 0.01UF K CHIP C 22PF J CHIP C 0.01UF K ELECTR0 1.0UF 50WV | | |
| C212, 213 C214, 215 C216 C217, 218 C219-221 | | | CK73FB1E103K CK73FF1E104Z CK73FF1E104Z CK73FF1E104Z CK73FB1E103K | CHIP C 0.01UF K CHIP C 0.1UF Z CHIP C 0.1UF Z CHIP C 0.1UF Z CHIP C 0.01UF K | 690S | |
| C222 C223 C224, 225 C226 C227-231 | | | CC73FSL1H331J CK73FF1E104Z CK73FB1H102K CE04EW1H010M CK73FB1E103K | CHIP C 330PF J CHIP C 0.1UF Z CHIP C 1000PF K ELECTR0 1.0UF 50WV CHIP C 0.01UF K | | |

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TS-450S : K,X,P,E,E2,M,M2
TS-690S : K,X,P,E,E2,M

⚠ indicates safety critical components.

PARTS LIST

× New Parts

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RF UNIT (X44-3130-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|---|---------------|--------------|---|---|------------------------|--------------------|
| C232 C233, 234 C235 C236 C237-241 | | | CK73FB1H102K CK73FB1E103K CE04EW1H2R2M CK73FB1H102K CK73FB1E103K | CHIP C 1000PF K CHIP C 0.01UF K ELECTRO 2.2UF 50WV CHIP C 1000PF K CHIP C 0.01UF K | 690S | |
| C242 C243 C244 C245 C246 | | | CK73FB1E103K CK73FF1E104Z CC73FCH1H150J CK73FB1E103K CC73FCH1H150J | CHIP C 0.01UF K CHIP C 0.1UF Z CHIP C 15PF J CHIP C 0.01UF K CHIP C 15PF J | | |
| C247 C248, 249 C250, 251 C252 C253, 254 | | | CK73FB1E103K CC73FCH1H100D CK73FB1E103K CC73FCH1H050C CK73FB1E473K | CHIP C 0.01UF K CHIP C 10PF D CHIP C 0.01UF K CHIP C 5PF C CHIP C 0.047UF K | | |
| C255 C256 C257, 258 C259 C260 | | | CK73FB1E103K CK73FF1E104Z CK73FB1H102K CK73FB1E103K CE04EW1C100M | CHIP C 0.01UF K CHIP C 0.1UF Z CHIP C 1000PF K CHIP C 0.01UF K ELECTRO 10UF 15WV | | |
| C261 C262 C263 C264 C265 | | | CK73FB1E473K CK73FF1E104Z CC73FCH1H030C CK73FB1E473K CK73FB1E103K | CHIP C 0.047UF K CHIP C 0.1UF Z CHIP C 3PF C CHIP C 0.047UF K CHIP C 0.01UF K | | |
| C266 C267 C268 C269 C501-514 | | | CC73FSL1H471J CC73FCH1H100D CK73FB1E103K CK73FB1H102K CC73FCH1H101J | CHIP C 47PF J CHIP C 10PF D CHIP C 0.01UF K CHIP C 0.001UF K CHIP C 100PF J | | |
| C515 C516-519 TC1, 2 | | | CK73FF1E104Z CK73FB1H102K C05-0356-05 | CHIP C 0.1UF Z CHIP C 1000PF K TRIM CAP 20PF | | |
| A1 -4 A9 CN1 CN2 CN3 | | | J32-0761-04 E23-0623-04 E40-5348-05 E40-5467-05 E40-3239-05 | STUD TERMINAL (GND) PIN CONNECTOR (15P) PIN CONNECTOR (10P) PIN CONNECTOR (4P) | | |
| CN4 CN5 CN6 CN7, 8 CN9 -11 | | | E40-3238-05 E40-3237-05 E40-3239-05 E40-3237-05 E04-0154-05 | PIN CONNECTOR (3P) PIN CONNECTOR (2P) PIN CONNECTOR (4P) PIN CONNECTOR (2P) RF COAXIAL CABLE RECEPTACLE | | |
| CN12-15 CN501 CN502 J1 TP1, 2 | | | E40-5059-05 E40-5427-05 E40-3241-05 E06-0858-15 E40-3246-05 | PIN CONNECTOR (5P) PIN CONNECTOR (20P) PIN CONNECTOR (6P) CYLINDRICAL RECEPTACLE (8P) PH CONNECTOR (73.05MHZ) | | |
| TP3 W1 W501 W502 | | | E23-0512-05 R92-0150-05 E37-0253-05 E37-0254-05 | TERMINAL (CAL) JAMPER R 0 OHM FINISHED WIRE SET FINISHED WIRE SET | | |
| A5 -8 | | | N30-3010-46 | PAN HEAD MACHINE SCREW | | |

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RF UNIT (X44-3130-XX)

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|------------------|---------------|-------------------|-------------------|------------------------------|------------------------|--------------------|
| CF1 | | | L72-0351-05 | CERAMIC FILTER (8.83MHZ) | | |
| L1 | | | L40-1011-15 | SMALL FIXED INDUCTOR(100UH) | | |
| L2 | | | L34-1163-05 | COIL (9T) | | |
| L3 | | | L34-1162-05 | COIL (6T) | | |
| L4 | | | L40-1021-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L5 ,6 | | | L40-1501-15 | SMALL FIXED INDUCTOR(15UH) | | |
| L7 | | | L40-1021-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L8 ,9 | | | L40-5691-15 | SMALL FIXED INDUCTOR(5.6UH) | | |
| L10 | | | L40-1021-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L11 | | | L40-1592-15 | SMALL FIXED INDUCTOR(1.5UH) | | |
| L12 | | | L40-8291-15 | SMALL FIXED INDUCTOR(8.2UH) | | |
| L13 | | | L40-1592-15 | SMALL FIXED INDUCTOR(1.5UH) | | |
| L14 | | | L40-1021-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L15 | | * | L40-4791-15 | SMALL FIXED INDUCTOR(4.7UH) | | |
| L16 | | | L40-4701-15 | SMALL FIXED INDUCTOR(47UH) | | |
| L17 | | | L40-1292-15 | SMALL FIXED INDUCTOR(1.2UH) | | |
| L18 | | | L40-5691-15 | SMALL FIXED INDUCTOR(5.6UH) | | |
| L19 | | | L40-1292-15 | SMALL FIXED INDUCTOR(1.2UH) | | |
| L20 | | | L40-1092-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L21 | | | L40-2792-15 | SMALL FIXED INDUCTOR(2.7UH) | | |
| L22 | | | L40-1092-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L23 | | | L40-3382-15 | SMALL FIXED INDUCTOR(0.33UH) | | |
| L24 | | | L40-2792-15 | SMALL FIXED INDUCTOR(2.7UH) | | |
| L25 | | | L40-3382-15 | SMALL FIXED INDUCTOR(0.33UH) | | |
| L26 | | | L40-2282-15 | SMALL FIXED INDUCTOR(0.22UH) | | |
| L27 | | | L40-2292-15 | SMALL FIXED INDUCTOR(2.2UH) | | |
| L28 ,29 | | | L40-2282-15 | SMALL FIXED INDUCTOR(0.22UH) | | |
| L30 | | | L40-1092-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L31 | | | L40-2282-15 | SMALL FIXED INDUCTOR(0.22UH) | | |
| L32 | | | L34-1163-05 | COIL (9T) | | |
| L33 | | * | L40-4782-15 | SMALL FIXED INDUCTOR(0.47UH) | | |
| L34 | | | L34-1163-05 | COIL (9T) | | |
| L35 | | | L34-4007-05 | COIL | | |
| L36 | | | L40-1001-15 | SMALL FIXED INDUCTOR(10UH) | | |
| L37 | | | L40-1011-15 | SMALL FIXED INDUCTOR(100UH) | | |
| L38 | | | L34-1162-05 | COIL (6T) | 690S | |
| L39 | | | L40-3382-15 | SMALL FIXED INDUCTOR(0.33UH) | 690S | |
| L40 | | | L34-1162-05 | COIL (6T) | 690S | |
| L41 | | | L34-4002-05 | COIL | 690S | |
| L42 | | | L34-1001-05 | SMALL FIXED INDUCTOR(10UH) | 690S | |
| L43 | | | L40-1001-15 | SMALL FIXED INDUCTOR(10UH) | | |
| L44 | | | L40-1011-15 | SMALL FIXED INDUCTOR(100UH) | 690S | |
| L45 | | | L40-1021-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L46 | | | L19-0324-05 | BALUN TRANSFORMER | | |
| L47 | | | L40-3391-15 | SMALL FIXED INDUCTOR(3.3UH) | | |
| L48 | | | L19-0324-05 | BALUN TRANSFORMER | | |
| L49 | | | L34-1163-05 | COIL (9T) | | |
| L50 | | | L34-1162-05 | COIL (6T) | | |
| L51 | | | L19-0324-05 | BALUN TRANSFORMER | | |
| L52 | | | L40-1011-15 | SMALL FIXED INDUCTOR(100UH) | | |
| L53 | | | L34-4222-05 | COIL | | |
| L54 ,55 | | | L34-4006-05 | COIL | | |
| L56 | | | L39-0454-05 | TOROIDAL COIL | | |
| L57 | | | L40-1001-15 | SMALL FIXED INDUCTOR(10UH) | | |
| L58 | | | L39-0432-05 | TOROIDAL COIL | | |

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PARTS LIST

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RF UNIT (X44-3130-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| L59 | | | L40-1011-15 | SMALL FIXED INDUCTOR(100UH) | | |
| L60 | | | L40-2292-15 | SMALL FIXED INDUCTOR(2.2UH) | | |
| L61 | | | L40-1021-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L62 | | * | L40-1892-15 | SMALL FIXED INDUCTOR(1.8UH) | | |
| L63 | | | L40-1092-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L64 | | | L40-1292-15 | SMALL FIXED INDUCTOR(1.2UH) | | |
| L65 | | | L40-1011-15 | SMALL FIXED INDUCTOR(100UH) | | |
| L66 ,67 | | | L34-4190-05 | COIL | | |
| L68 | | | L34-4211-05 | COIL | | |
| L69 ,70 | | | L39-0454-05 | TOLOIDAL COIL | | |
| L71 | | | L34-4209-05 | COIL | | |
| L72 ,73 | | | L34-0943-05 | COIL | | |
| L74 ,75 | | | L34-0941-05 | COIL | | |
| L76 | | | L34-0943-05 | COIL | | |
| L77 | | | L34-0664-05 | COIL | | |
| L78 | | | L40-1011-12 | SMALL FIXED INDUCTOR(100UH) | | |
| L79 | | | L40-4701-15 | SMALL FIXED INDUCTOR(47UH) | | |
| L80 ,81 | | | L40-1011-15 | SMALL FIXED INDUCTOR(100UH) | | |
| L84 | | | L40-1021-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L85 | | * | L40-1801-15 | SMALL FIXED INDUCTOR(18UH) | | |
| L86 | | | L34-0535-05 | COIL | | |
| L87 | | | L34-0536-05 | COIL | | |
| L88 | | | L40-1021-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L89 | | | L34-4190-05 | COIL | | |
| L90 | | | L40-1092-15 | SMALL FIXED INDUCTOR(1UH) | | |
| L91 | | | L34-4207-05 | COIL | | |
| L92 | | | L34-0943-05 | COIL | | |
| L93 | | | L34-0781-05 | COIL | | |
| L94 | | | L34-0536-05 | COIL | | |
| L97 | | | L40-1011-15 | SMALL FIXED INDUCTOR(100UH) | | |
| X1 | | * | L71-0423-05 | MCF 73.05MHZ | | |
| X2 | | | L71-0260-05 | MCF 8.83MHZ | | |
| R1 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R2 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R3 | | | RK73FB2A560J | CHIP R 56 J 1/10W | | |
| R4 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R5 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R6 ,7 | | | RK73FB2A390J | CHIP R 39 J 1/10W | | |
| R8 | | | RK73FB2A100J | CHIP R 10 J 1/10W | | |
| R9 | | | RK73EB2B330J | CHIP R 33 J 1/8W | | |
| R10 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R11 | | | RK73EB2B330J | CHIP R 33 J 1/8W | | |
| R12 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R13 | | | RK73EB2B330J | CHIP R 33 J 1/8W | | |
| R14 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R15 | | | RK73EB2B330J | CHIP R 33 J 1/8W | | |
| R16 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R17 | | | RK73EB2B330J | CHIP R 33 J 1/8W | | |
| R18 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R19 | | | RK73EB2B330J | CHIP R 33 J 1/8W | | |
| R20 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R21 | | | RK73EB2B330J | CHIP R 33 J 1/8W | | |
| R22 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R23 | | | RK73FB2A330J | CHIP R 33 J 1/10W | | |

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TS-450S/690S

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| R24 ,25 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R26 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R27 | | | RK73FB2A122J | CHIP R 1.2K J 1/10W | | |
| R28 | | | RK73FB2A100J | CHIP R 10 J 1/10W | | |
| R29 ,30 | | | RK73FB2A271J | CHIP R 270 J 1/10W | | |
| R31 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R32 | | | RK73FB2A330J | CHIP R 33 J 1/10W | 690S | |
| R33 | | | RK73FB2A680J | CHIP R 68 J 1/10W | 690S | |
| R34 | | | RK73FB2A101J | CHIP R 100 J 1/10W | 690S | |
| R35 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R36 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | 690S | |
| R37 | | | RK73FB2A122J | CHIP R 1.2K J 1/10W | 690S | |
| R38 ,39 | | | RK73FB2A271J | CHIP R 270 J 1/10W | 690S | |
| R40 | | | RK73FB2A121J | CHIP R 120 J 1/10W | | |
| R41 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R42 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R43 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R44 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R45 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R46 | | | RK73FB2A391J | CHIP R 390 J 1/10W | | |
| R47 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R48 ,49 | | | RK73FB2A391J | CHIP R 390 J 1/10W | | |
| R50 -53 | | | RK73FB2A100J | CHIP R 10 J 1/10W | | |
| R54 | | | RK73FB2A271J | CHIP R 270 J 1/10W | | |
| R55 | | | RK73FB2A332J | CHIP R 3.3K J 1/10W | | |
| R56 | | | RK73FB2A103J | CHIP R 10K J 1/10W | 690S | |
| R57 -60 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R61 -69 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R70 | | | RK73FB2A100J | CHIP R 10 J 1/10W | 690S | |
| R71 ,72 | | | RK73FB2A151J | CHIP R 150 J 1/10W | | |
| R73 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R74 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R75 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R76 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R77 -79 | | | RK73FB2A330J | CHIP R 33 J 1/10W | | |
| R80 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R81 | | | RK73FB2A561J | CHIP R 560 J 1/10W | | |
| R82 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R83 | | | RK73FB2A151J | CHIP R 150 J 1/10W | | |
| R84 | | | RK73FB2A560J | CHIP R 56 J 1/10W | | |
| R85 | | | RK73FB2A392J | CHIP R 3.9K J 1/10W | | |
| R86 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R87 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R88 | | | RK73FB2A561J | CHIP R 560 J 1/10W | | |
| R89 ,90 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R91 ,92 | | | RK73FB2A331J | CHIP R 330 J 1/10W | | |
| R93 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R94 ,95 | | | RK73FB2A330J | CHIP R 33 J 1/10W | | |
| R96 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R97 | | | RK73FB2A273J | CHIP R 27K J 1/10W | | |
| R98 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R99 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R100 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R101 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R102 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| R103 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R104 | | | RK73FB2A561J | CHIP R 560 J 1/10W | | |
| R105 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R106 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R107 | | | RK73FB2A150J | CHIP R 15 J 1/10W | | |
| R108 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R109 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R110 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R111 | | | RK73FB2A560J | CHIP R 56 J 1/10W | | |
| R112 | | | RK73FB2A681J | CHIP R 680 J 1/10W | | |
| R113 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R114 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R115 | | | RK73FB2A474J | CHIP R 470K J 1/10W | | |
| R116 | | | RK73FB2A181J | CHIP R 180 J 1/10W | | |
| R117 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R118 | | | RK73FB2A330J | CHIP R 33 J 1/10W | | |
| R119 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R120 | | | RK73FB2A330J | CHIP R 33 J 1/10W | | |
| R121, 122 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R123 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R124 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R125 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R126 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R127, 128 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R129 | | | RK73FB2A181J | CHIP R 180 J 1/10W | | |
| R130 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R131 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R132 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R133 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R134 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R135 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R136 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R137 | | | RK73FB2A100J | CHIP R 10 J 1/10W | | |
| R138-140 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R141 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R142 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R143 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R144 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R145 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R146 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R147 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R148 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R149 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R150 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R151 | | | RK73FB2A393J | CHIP R 39K J 1/10W | | |
| R152 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R153, 154 | | | RK73FB2A330J | CHIP R 33 J 1/10W | | |
| R155, 156 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R157 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R158 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R159 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R160 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R161-166 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R167 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R168 | | | R92-0670-05 | CHIP R 0 OHM | | |

L:Scandinavia

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TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

⚠ indicates safety critical components.

PARTS LIST

* New Parts

Parts without Parts No. are not supplied.

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Teile ohne Parts No. werden nicht geliefert.

RF UNIT (X44-3130-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| R169 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R170 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R171 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R172 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R173 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R174 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R175 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R176 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R177 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R178 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R179 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R180 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R181 | | | RK73FB2A683J | CHIP R 68K J 1/10W | | |
| R182 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R183 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R184 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R185 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R186 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R187, 188 | | | RK73FB2A474J | CHIP R 470K J 1/10W | | |
| R189 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R190 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R191 | | | RK73FB2A153J | CHIP R 15K J 1/10W | | |
| R192-193 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R194 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R195 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R196 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R197 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R198 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R199 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R200 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R201 | | | RK73FB2A273J | CHIP R 27K J 1/10W | | |
| R202 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R203 | | | RK73FB2A680J | CHIP R 68 J 1/10W | | |
| R204, 205 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R206-209 | | | RK73FB2A330J | CHIP R 33 J 1/10W | | |
| R210 | | | RK73FB2A334J | CHIP R 330K J 1/10W | | |
| R211 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R212 | | | RK73FB2A823J | CHIP R 82K J 1/10W | | |
| R213 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R214 | | | RK73FB2A821J | CHIP R 820 J 1/10W | | |
| R215, 216 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R217 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R218 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R219 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R220 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R221, 222 | | | RK73FB2A332J | CHIP R 3.3K J 1/10W | | |
| R223 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R224 | | | RK73FB2A392J | CHIP R 3.9K J 1/10W | | |
| R225 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R226 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R227 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R228, 229 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R230 | | | RK73FB2A560J | CHIP R 56 J 1/10W | | |
| R231 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R232 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |

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Y:PX(Far East, Hawaii)

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PARTS LIST

x New Parts

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RF UNIT (X44-3130-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|--------------|-------------------|-------------------------|------------------------|--------------------|
| R233 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R234 | | | R92-0670-05 | CHIP R 0 OHM | | |
| R235 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R236 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R237 | | | RK73FB2A271J | CHIP R 270 J 1/10W | | |
| R238 | | | RK73FB2A104J | CHIP R 100K J 1/10W | 690S | |
| R239 | | | RK73FB2A393J | CHIP R 39K J 1/10W | | |
| R240 | | | R92-0670-05 | CHIP R 0 OHM | | |
| R241 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R242 | | | RK73FB2A123J | CHIP R 12K J 1/10W | | |
| R243 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R244 | | | RK73FB2A121J | CHIP R 120 J 1/10W | | |
| R245 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R247, 248 | | | R92-0679-05 | CHIP R 0 OHM | 690S | |
| R249 | | | R92-0679-05 | CHIP R 0 OHM | | |
| R250 | | | R92-0679-05 | CHIP R 0 OHM | | |
| R251 | | | RK73FB2A273J | CHIP R 27K J 1/10W | | |
| R501 | | | RK73FB2A561J | CHIP R 560 J 1/10W | | |
| R502 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| VR1 | | | R12-6421-05 | TRIM POT. 4.7K | | |
| VR2 | | | R12-6415-05 | TRIM POT. 470 | 690S | |
| VR3 | | | R12-6427-05 | TRIM POT. 47K | | |
| VR4 | | | R12-6427-05 | TRIM POT. 47K | | |
| VR5 , 6 | | | R12-6415-05 | TRIM POT. 470 | | |
| K1 | | | S51-1436-05 | RELAY | | |
| S1 -20 | | | S70-0403-05 | TACT SWITCH | | |
| S21 -30 | | | S70-0403-05 | TACT SWITCH | | |
| S31 -35 | | * | S70-0411-05 | TACT SWITCH | | |
| S36 | | | S40-2440-15 | PUSH SWITCH | | |
| S37 | | * | S40-2366-05 | PUSH SWITCH | | |
| S38 | | | S40-2440-15 | PUSH SWITCH | | |
| S39 | | * | S40-2366-05 | PUSH SWITCH | | |
| D1 | | | V08(G) | TRANSISTOR | | |
| D2 , 3 | | | RLS245 | DIODE | | |
| D4 | | | V08(G) | TRANSISTOR | | |
| D5 | | | LFB01 | DIODE | | |
| D6 -15 | | | RLS135 | DIODE | | |
| D16 | | | RLS135 | DIODE | 690S | |
| D17 -25 | | | RLS135 | DIODE | | |
| D26 | | | RLS135 | DIODE | 690S | |
| D27 -30 | | | RLS135 | DIODE | | |
| D31 , 32 | | | RLS73 | DIODE | | |
| D33 | | | RLZ5.1A | DIODE | | |
| D34 | | | RLS73 | DIODE | | |
| D35 | | | RLS73 | DIODE | 690S | |
| D36 , 37 | | | RLS135 | DIODE | | |
| D38 | | | RLS73 | DIODE | | |
| D39 -52 | | | RLS135 | DIODE | | |
| D53 | | | HSM88AS | DIODE | | |
| D54 | | | RLS73 | DIODE | | |
| D55 | | | RLS135 | DIODE | | |
| D56 | | | RLZ5.1A | DIODE | | |
| D57 -59 | | | RLS135 | DIODE | | |
| D61 , 62 | | | RLS135 | DIODE | | |

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PARTS LIST

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RF UNIT (X44-3130-XX)

FINAL UNIT : HF 100W (X45-3400-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|--|---------------|-------------------|---|--|------------------------|--------------------|
| D63 ,64 D501 D502 D503-511 IC1 | | | RLS135 B30-2005-05 B30-2006-05 RLS73 TC9174F | DIODE LED LED DIODE IC(CMOS I/O) | 690S | |
| IC2 IC3 IC4 IC5 Q1 | | * | SN74LS145NS TC9174F TC4066BF AN612 DTD114EK | IC IC(CMOS I/O) IC(BILATERAL SWITCH X4) IC(BALANCE MODULATOR) DIGITAL TRANSISTOR | | |
| Q2 Q3 Q4 Q5 ,6 Q7 | | | DTA143EK 2SK520(K44) 2SC2714(Y) DTC124EK 2SK520(K44) | DIGITAL TRANSISTOR FET TRANSISTOR DIGITAL TRANSISTOR FET | 690S | |
| Q8 Q9 ,10 Q11 -13 Q14 -17 Q18 | | | 2SC2714(Y) 2SK520(K44) DTA114EK 2SK520(K44) 2SC2954(QK) | TRANSISTOR FET DIGITAL TRANSISTOR FET TRANSISTOR | 690S | |
| Q19 -21 Q22 Q23 Q24 Q25 | | | 3SK131(M) DTA124EK DTC124EK 2SC2954(QK) 3SK131(M) | FET DIGITAL TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR FET | 690S 690S | |
| Q26 ,27 Q28 -30 Q31 Q32 -34 Q35 | | | 2SK520(K44) 3SK131(M) 2SK210(GR) 2SC2714(Y) 2SC2712(Y) | FET FET FET TRANSISTOR TRANSISTOR | | |
| Q36 Q37 ,38 Q39 Q40 Q41 | | | 2SC2714(Y) 2SC2712(Y) DTA124EK DTC124EK 2SC2712(Y) | TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR | | |
| Q42 ,43 Q45 ,46 Q48 | | | DTC114EK 3SK131(M) 3SK131(M) | DIGITAL TRANSISTOR FET FET | | |
| TH1 TH2 -4 TH5 | | * | 157-502-55007 157-302-53008 157-103-55001 | THERMISTOR 5K THERMISTOR 3K THERMISTOR 10K | | |
| Z1 | | | X59-3350-00 | MODULE UNIT(NB) | | |
| FINAL UNIT : HF 100W (X45-3400-XX) -00 : TS-690S -01 : TS-450S | | | | | | |
| C1 C2 C3 ,4 C5 C6 -8 C9 C10 ,11 C12 C13 C14 | | | CK45B1H561K CK45F1H103Z CK45F1H223Z CK45B1H102K CK45F1H223Z CM93D2H681J C91-1004-05 CC45SL2H151J CM73F2H122J CK45F1H223Z | CERAMIC 560PF K CERAMIC 0.010UF Z CERAMIC 0.022UF Z CERAMIC 1000PF K CERAMIC 0.022UF Z MICA 680PF J CHIP C 0.0068UF J CERAMIC 150PF J CHIP C 1200PF J CERAMIC 0.022UF Z | | |

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TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

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| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| C15 | | | C91-0119-05 | CERAMIC 0.047UF K | | |
| C16 | | | CE04EW1C100M | ELECTRO 10UF 16WV | | |
| C17 | | | CK45F1H223Z | CERAMIC 0.022UF Z | | |
| C18 | | | CE04EW1E101M | ELECTRO 100UF 25WV | | |
| C19 | | | CK45F1H223Z | CERAMIC 0.022UF Z | | |
| C20 | | | CK45B1H102K | CERAMIC 1000PF K | | |
| C21 | | | C91-0119-05 | CERAMIC 0.047UF K | | |
| C22 | | | CE04EW1C100M | ELECTRO 10UF 16WV | | |
| C23 | | | CK45F1H473Z | CERAMIC 0.047UF Z | | |
| C24 | | | CE04EW1E101M | ELECTRO 100UF 25WV | | |
| C25 | | | CK45F1H473Z | CERAMIC 0.047UF Z | | |
| C26 | | | CK45F1H103Z | CERAMIC 0.010UF Z | | |
| C27 | | | CK45F1H103Z | CERAMIC 0.010UF Z | | |
| C28 | | | CE04EW1E470M | ELECTRO 47UF 25WV | | |
| C29 , 30 | | | CK45F1H103Z | CERAMIC 0.010UF Z | | 690S |
| C31 | | | C90-0817-05 | ELECTRO 1000UF 16WV | | |
| C32 | | | CK45F1H473Z | CERAMIC 0.047UF Z | | |
| C33 | | | C90-0817-05 | ELECTRO 1000UF 16WV | | |
| C34 | | | CK45F1H473Z | CERAMIC 0.047UF Z | | |
| C35 | | | CE04EW1E470M | ELECTRO 47UF 25WV | | |
| C36 | | | CK45F1H223Z | CERAMIC 0.022UF Z | | |
| C37 | | | C91-0119-05 | CERAMIC 0.047UF K | | |
| C38 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | |
| C39 | | | CE04EW1E470M | ELECTRO 47UF 25WV | | |
| C40 | | | CK45F1H223Z | CERAMIC 0.022UF Z | | |
| C41 | | | C91-0119-05 | CERAMIC 0.047UF K | | |
| C42 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | |
| C43 | | | CC45SL2H121J | CERAMIC 120PF J | | |
| C45 | | | CK45F1H103Z | CERAMIC 0.010UF Z | | |
| C47 | | | CE04EW1A101M | ELECTRO 100UF 10WV | | 690S |
| C48 | | | CE04EW1E470M | ELECTRO 47UF 25WV | | |
| C49 | | | CK45F1H223Z | CERAMIC 0.022UF Z | | |
| C50 | | | C91-0119-05 | CERAMIC 0.047UF K | | |
| C51 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | |
| C52 , 53 | | | C91-1075-05 | CERAMIC 470PF K | | |
| C63 | | | CK45B1H471K | CERAMIC 470PF K | | |
| CN1 | | | E04-0154-05 | RF COAXIAL CABLE RECEPTACLE | | |
| CN2 | | | E40-3243-05 | PIN CONNECTOR (8P) | | |
| CN3 | | | E40-3238-05 | PIN CONNECTOR (3P) | | |
| CN4 | | | E40-3240-05 | PIN CONNECTOR (5P) | | |
| CN6 | | | E40-3239-05 | PIN CONNECTOR (4P) | | 690S |
| CN7 | | | E04-0154-05 | RF COAXIAL CABLE RECEPTACLE | | 690S |
| CN8 , 9 | | | E40-3246-05 | PH CONNECTOR (2P) | | |
| K1 | | | S76-0408-05 | RELAY | | 690S |
| TP1 -3 | | | E23-0512-05 | TERMINAL (FOR D1) | | |
| 285 | 3J | | F01-0986-01 | HEAT SINK | | |
| 286 | 2K | * | F20-1072-04 | INSULATING BOARD | | |
| 288 | 2J | | F29-0014-05 | INSULATOR | | |
| 290 | 2K | | G02-0574-04 | FLAT SPRING | | |
| - | | | J61-0307-05 | WIRE BAND | | |
| L1 | | | L40-1501-14 | SMALL FIXED INDUCTOR(15UH) | | |
| L2 | | | L40-3391-14 | SMALL FIXED INDUCTOR(3.3UH) | | |

L:Scandinavia

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TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

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TS-450S/690S

PARTS LIST

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FINAL UNIT : HF 100W (X45-3400-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|---|---------------|-------------------|--|--|------------------------|--------------------|
| L3 L4 ,5 L6 ,7 L8 L9 | | | L19-0315-25 L33-0699-05 L33-0232-05 L33-0699-05 L19-0342-05 | BALUN TRANSFORMER CHOKE COIL CHOKE COIL 1UH CHOKE COIL BALUN TRANSFORMER | | |
| L10 ,11 L12 L13 L14 L15 | | * | L33-0617-05 L39-0482-05 L39-1209-05 L33-0651-05 L33-0617-05 | RFC TOROIDAL COIL (NFB) TOROIDAL COIL (FINAL/100W 4T) CHOKE COIL RFC | | |
| L16 L17 L18 | | | L40-1011-13 L15-0016-05 L40-4701-13 | SMALL FIXED INDUCTOR(100UH) LOW-FREQUENCY CHOKE COIL SMALL FIXED INDUCTOR(47UH) | | |
| - X N | 2J 2J | | N09-2077-05 N30-3008-46 N07-3006-46 | SCREW PAN HEAD MACHINE SCREW BRAZIER HEAD TAPTITE SCREW | | |
| R1 R2 ,3 R4 R5 R6 ,7 | | | RD14BB2C560J RD14BB2C331J RD14BB2C681J RC05GF2H5R6J RD14CB2E150J | RD 56 J 1/6W RD 330 J 1/6W RD 680 J 1/6W RC 5.6 J 1/2W RD 15 J 1/4W | | |
| R8 ,9 R10 -13 R14 ,15 R16 ,17 R18 | | | RS14DB3A181J RS14DB3A5R6J RS14DB3A150J RS14DB3A3R3J RS14DB3A100J | FL-PROOF RS 180 J 1W FL-PROOF RS 5.6 J 1W FL-PROOF RS 15 J 1W FL-PROOF RS 3.3 J 1W FL-PROOF RS 10 J 1W | | |
| R19 R20 R21 R22 R23 | | | RD14BB2C561J RD14BB2C101J RS14DB3A180J RD14BB2C101J RD14BB2C151J | RD 560 J 1/6W RD 100 J 1/6W FL-PROOF RS 18 J 1W RD 100 J 1/6W RD 150 J 1/6W | | |
| R24 R25 R26 R27 R31 | | | RD14BB2C681J RD14BB2C473J RD14BB2C332J RD14BB2C472J RS14DB3A180J | RD 680 J 1/6W RD 47K J 1/6W RD 3.3K J 1/6W RD 4.7K J 1/6W FL-PROOF RS 18 J 1W | | |
| VR1 ,2 | | * | R12-6734-05 | TRIMMING POT. 1K | | |
| D1 D2 ,3 D4 D5 D6 | | | K8-365 SV03YS 1S1555 1S1555 SG-5L(R) | DIODE DIODE DIODE DIODE DIODE | 690S | |
| D7 ,8 IC1 IC2 IC3 Q1 | | | 1SS133 UPC7808H UPC7805H UPC7808H 2SC1971 | DIODE IC(VOLTAGE REGULATOR/ +8V) IC(VOLTAGE REGULATOR/ +5V) IC(VOLTAGE REGULATOR/ +8V) TRANSISTOR | 690S | |
| Q2 ,3 Q4 ,5 Q6 ,7 Q8 TH1 | | | 2SC2509 2SC2879 2SD1406(Y) 2SC1959(Y) 5TP41L | TRANSISTOR TRANSISTOR TRANSISTOR TRANSISTOR DIODE | | |
| - | | | X59-3370-00 | MODULE UNIT(FAN) | | |

L:Scandinavia

K:USA

P:Canada

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

Y:PX(Far East, Hawaii)

T:England

E:Europe

Y:AAFES(Europe)

X:Australia

M:Other Areas

△ indicates safety critical components.

PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

FINAL UNIT : HF 100W (X45-3400-XX)

FINAL UNIT : 50M 10W (X45-3420-00)

FINAL UNIT : 50M 50W (X45-3430-00)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| W1 | | | E37-0114-05 | FINISHED WIRE SET(DRV) | | |
| W2 | | * | E37-0190-05 | FINISHED WIRE SET(100W DC) | | |
| W3 | | * | E33-1945-15 | FINISHED WIRE SET(HF) | | |
| W4 | | * | E33-1946-05 | FINISHED WIRE SET(50MHZ) | 690S | |
| W5 | | * | E33-1945-15 | FINISHED WIRE SET(HF) | | |
| W6 | | * | E33-1946-05 | FINISHED WIRE SET(50MHZ) | 690S | |
| W10 , 11 | | | R92-1061-05 | JUMPER REST 0 OHM | 450S | |
| W12 | | | R92-1061-05 | JUMPER REST 0 OHM | | |
| FINAL UNIT : 50M 10W (X45-3420-00) | | | | | | |
| C1 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C2 | | | CC73FSL1H121J | CHIP C 120PF J | | |
| C3 , 4 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C5 | | | CK73FB1H472K | CHIP C 4700PF K | | |
| C6 | | | CE04EW1E470M | ELECTRO 47UF 25WV | | |
| C7 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C8 | | | CK73FB1H472K | CHIP C 4700PF K | | |
| C9 | | | CE04EW1C330M | ELECTRO 33UF 16WV | | |
| C10 | | | CK73FB1H472K | CHIP C 4700PF K | | |
| C11 | | | CE04EW1E470M | ELECTRO 47UF 25WV | | |
| C12 , 13 | | | CC45SL2H560J | CERAMIC 56PF J | | |
| C14 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C15 | | | CC73FCH1H120J | CHIP C 12PF J | | |
| C16 | | | CC45CH1H120J | CERAMIC 12PF J | | |
| TC1 | | | C05-0030-15 | TRIMMING CAP 20PF | | |
| CN1 , 2 | | | E04-0159-05 | RF COAXIAL CABLE RECEPTACLE | | |
| CN3 | | | E40-3239-05 | PIN CONNECTOR | | |
| L1 | | | L34-1022-05 | COIL | | |
| L2 | | | L33-0222-05 | CHOKER COIL | | |
| L3 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| L4 | | | L33-0651-05 | CHOKER COIL | | |
| L5 | | | L34-1027-05 | COIL | | |
| R1 | | | RK73FB2A332J | CHIP R 3.3K J 1/10W | | |
| R2 | | | RK73FB2A561J | CHIP R 560 J 1/10W | | |
| R3 | | | RK73EB2B100J | CHIP R 10 J 1/8W | | |
| R4 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| IC1 | | | M57735 | IC(Power MODULE) | | |
| Q1 | | | 2SC2954(QK) | TRANSISTOR | | |
| FINAL UNIT : 50M 50W (X45-3430-00) | | | | | | |
| C1 | | | CC45SL2H330J | CERAMIC 33PF J | | |
| C2 | | | CM93D2H391J | MICA 390PF J | | |
| C3 , 4 | | * | CK45B1H272K | CERAMIC 2700PF K | | |
| C5 | | | CM93D2H331J | MICA 330PF J | | |
| C6 | | | CK45B1H102K | CERAMIC 1000PF K | | |
| C7 | | | C91-0119-05 | CERAMIC 0.047UF K | | |
| C8 | | | CE04EW1C100M | ELECTRO 10UF 16WV | | |
| C9 | | | CE04EW1E101M | ELECTRO 100UF 25WV | | |
| C10 , 11 | | | CK45F1H473Z | CERAMIC 0.047UF Z | | |
| C12 , 13 | | | CK45B1H102K | CERAMIC 1000PF K | | |
| C14 | | | CE04EW1E100M | ELECTRO 10UF 25WV | | |
| C15 | | | CE04EW1C101M | ELECTRO 100UF 16WV | | |
| - | | | E31-6118-05 | CONNECTING WIRE | | |
| - | | | E37-0201-05 | CONNECTING WIRE | | |
| CN1 | | * | E04-0157-05 | RF COAXIAL CABLE RECEPTACLE | | |

L:Scandinavia

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X:Australia

M:Other Areas

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

△ indicates safety critical components.

TS-450S/690S

PARTS LIST

× New Parts

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FINAL UNIT : 50M 50W (X45-3430-00)

DIGITAL UNIT (X46-312X-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|--|----------------------|-------------------|---|---|------------------------|--------------------|
| CN2 CN3 TP1 W1 W2 | | | E40-3239-05 E40-3246-05 E23-0512-05 * E33-1947-05 * E33-1947-05 | PIN CONNECTOR PIN CONNECTOR TERMINAL FINISHED WIRE SET FINISHED WIRE SET | | |
| 301 303 305 | 1N 1M 2M | | F01-0987-12 * F09-0429-05 * F10-1497-03 | HEAT SINK HEAD PROTECTOR SHIELDING PLATE | | |
| 306 | 1N | | G02-0576-14 | LEAF SPRING | | |
| L1 L2 ,3 L4 L5 ,6 L7 | | | * L39-1211-05 * L33-0699-05 * L39-1212-05 * L33-0651-05 L40-1011-13 | COIL CHOKO COIL COIL CHOKO COIL SMALL FIXED INDUCTOR | | |
| L8 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| X K N I | 2M 1N 1N 1N | | N30-3008-46 N35-3018-46 N87-3006-46 N33-3006-41 | PAN HEAD MACHINE SCREW BINDING HEAD MACHINE SCREW BRAZIER HEAD TAPTITE SCREW OVAL HEAD MACHINE SCREW | | |
| R1 ,2 R3 R4 R5 R6 | | | RS14DB3A150J RD14BB2C561J RD14BB2C101J RS14DB3A220J RD14BB2C332J | FL-PROOF RS 15 J 1W RD 560 J 1/6W RD 100 J 1/6W FL-PROOF RS 22 J 1W RD 3.3K J 1/6W | | |
| R7 R8 VR1 W3 | | | RD14BB2C472J RS14DB3A220J R12-1083-05 R92-1061-05 | RD 4.7K J 1/6W FL-PROOF RS 22 J 1W TRIM POT. 1K JUMPER REST 0 OHM | | |
| D1 D2 Q1 ,2 Q3 Q4 | | | SV03YS 1S1555 2SC2879 2SD1406(Y) 2SC1959(Y) | DIODE DIODE TRANSISTOR TRANSISTOR TRANSISTOR | | |
| TH1 | | | 5TP41L | DIODE | | |
| - | | | X59-3370-00 | MODULE UNIT(FAN) | | |
| DIGITAL UNIT (X46-312X-XX) 0-11: TS-690S (K,P) 0-12: TS-450S (K,P) 0-21: TS-690S (X,M) 0-22: TS-450S (X,M) 0-23: TS-450S (M2) 2-71: TS-690S (E) 2-72: TS-450S (E) 2-73: TS-690S (E2) 2-74: TS-450S (E2) | | | | | | |
| C1 C2 C3 C4 C5 | | | CE04EW1A101M CE04EW1A470M CE04EW1E470M CE04EW1A101M CE04EW1A470M | ELECTRO 100UF 10WV ELECTRO 47UF 10WV ELECTRO 47UF 25WV ELECTRO 100UF 10WV ELECTRO 47UF 10WV | | |
| C6 C7 C8 C9 -12 C13 | | | CE04EW1A101M C90-2041-05 CE04EW1A101M CE04EW1A470M CE04EW1H3R3M | ELECTRO 100UF 10WV ELECTRO 10UF 10WV ELECTRO 100UF 10WV ELECTRO 47UF 10WV ELECTRO 3.3UF 50WV | | |
| C16 -33 C36 ,37 C38 -51 C52 -56 C58 -66 | | | CK73FB1E103K CC73FCH1H100D CK73FB1E103K CK73FB1H102K CK73FB1H102K | CHIP C 0.01UF K CHIP C 10PF D CHIP C 0.01UF K CHIP C 1000PF K CHIP C 1000PF K | | |

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Y:PX(Far East, Hawaii)

T:England

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M:Other Areas

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

△ indicates safety critical components.

PARTS LIST

* New Parts

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Te le onne Parts No. werden nicht geliefert.

DIGITAL UNIT (X46-312X-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|--------------------------------|------------------------|--------------------|
| C67 -79 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C80 -83 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C84 -88 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C89 -96 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C97 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C98 ,99 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C100-103 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C104-107 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C108 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C109-111 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C112,113 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C114-120 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C121-122 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C123-136 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C137,138 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C139-142 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C143-155 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| CN1 | | | E40-5467-05 | PIN CONNECTOR (10P) | | |
| CN2 | | | E40-3240-05 | PIN CONNECTOR (5P) | | |
| CN3 | | | E40-3237-05 | PIN CONNECTOR (2P) | | |
| CN4 | | | E40-5427-05 | PIN CONNECTOR (20P) | | |
| CN5 | | | E40-5154-05 | PIN CONNECTOR (12P) | | |
| CN6 | | | E40-5477-05 | PIN CONNECTOR (8P) | | |
| CN7 ,8 | | | E40-3239-05 | PIN CONNECTOR (4P) | | |
| CN9 | | * | E40-5381-05 | PIN CONNECTOR (16P) | | |
| CN10 | | | E40-3241-05 | PIN CONNECTOR (6P) | | |
| CN11 | | * | E40-5523-05 | PIN CONNECTOR (10P) | | |
| CN12 | | | E40-3238-05 | PIN CONNECTOR (3P) | | |
| CN13 | | * | E40-5426-05 | PIN CONNECTOR (20P) | | |
| CN14 | | | E40-3237-05 | PIN CONNECTOR (2P) | | |
| CN15 | | | E02-2015-05 | IC SOCKET | | |
| J1 | | | E56-0403-05 | CYLINDRICAL RECEPTACLE(ACC1) | | |
| L1 | | | L40-4711-12 | SMALL FIXED INDUCTOR(470UH) | | |
| L2 | | | L40-1011-14 | SMALL FIXED INDUCTOR(100UH) | | |
| L3 | | | L40-4711-13 | SMALL FIXED INDUCTOR(470UH) | | |
| L4 | | * | L40-2201-12 | SMALL FIXED INDUCTOR(22UH) | | |
| L5 | | | L40-2211-14 | SMALL FIXED INDUCTOR(20UH) | | |
| L6 ,7 | | | L40-1011-14 | SMALL FIXED INDUCTOR(100UH) | | |
| L8 | | | L40-1011-12 | SMALL FIXED INDUCTOR(100UH) | | |
| L9 ,10 | | | L40-1011-14 | SMALL FIXED INDUCTOR(100UH) | | |
| L11 ,12 | | | L40-4701-17 | SMALL FIXED INDUCTOR(47UH) | | |
| L13 ,14 | | | L40-1011-17 | SMALL FIXED INDUCTOR(100UH) | | |
| X1 | | | L77-1380-05 | CRYSTAL RESONATOR (11.0592MHZ) | | |
| CP1 | | | R90-0455-05 | MULTI-COMP 4.7KX8 J 1/4W | | |
| R1 | | | RK73FB2A273J | CHIP R 27K J 1/10W | | |
| R2 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R3 ,4 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R5 -12 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R13 ,14 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R15 -18 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R19 -23 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R25 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R26 -31 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |

L:Scandinavia

K:USA

P:Canada

TS-450S : K,X,P,E,E2,M,M2

Y:PX(Far East, Hawaii)

T:England

E:Europe

TS-690S : K,X,P,E,E2,M

Y:AAFES(Europe)

X:Australia

M:Other Areas

△ indicates safety critical components.

TS-450S/690S

PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

DIGITAL UNIT (X46-312X-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| R32 -39 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R40 -42 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R43 -46 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R47 -50 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R51 -54 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R55 ,56 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R57 ,58 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R59 ,60 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R61 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R62 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R63 -68 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R69 ,70 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R71 -74 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R75 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R76 -82 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R83 ,84 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R85 ,86 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R87 -100 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R101-108 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R109 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R110 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R111 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R112 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R113-116 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R117,118 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R121,122 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R123-126 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R127 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R130-146 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| D1 -5 | | | RLS73 | DIODE | | |
| D6 -13 | | | 02C25.1 | DIODE | | |
| D20 | | | 1SS133 | DIODE | | |
| D21 | | | 1SS133 | DIODE | | |
| D22 | | | 1SS133 | DIODE | | |
| D23 | | | 1SS133 | DIODE | | |
| D26 | | | RLS73 | DIODE | | |
| D26 | | | RLS73 | DIODE | | |
| D27 | | | RLS73 | DIODE | | |
| IC1 | | * | UPD78213GJ-58J | IC(CPU) | | |
| IC2 | | * | C256B-15XF1JBU1 | IC(ROM) | | |
| IC2 | | * | 27C256A-20JBU1 | IC(ROM) | | |
| IC3 | | * | LC3564PML-12 | IC(RAM) | | |
| IC4 | | | TC74HC573AF | IC(LATCH) | | |
| IC5 | | | TC74HC138AF | IC(DECODER) | | |
| IC6 ,7 | | | CXD1095Q | IC(I/O EXPANDER) | | |
| IC8 | | * | LZ92K371 | IC | | |
| IC9 | | | CAT35C104KI | IC(4K EEPROM) | | |
| IC10 | | | M51951BML | IC(SYSTEM RESET) | | |
| IC11 | | | TC7S08F | IC(2CH NAND GATE) | | |
| IC12 | | * | SN74AS04NS | IC | | |
| IC13-16 | | | TC4S584F | IC(SCHMITT TRIGGER) | | |
| Q1 | | | DTIC124EK | DIGITAL TRANSISTOR | | |
| Q2 ,3 | | | DTIC143EK | DIGITAL TRANSISTOR | | |
| Q4 ,5 | | | DTA143EK | DIGITAL TRANSISTOR | | |

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TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

 indicates safety critical components

PARTS LIST

x New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

DIGITAL UNIT (X46-312X-XX)

IF UNIT (X48-3090-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|---|---------------|--------------|-------------------|-------------------------|------------------------|--------------------|
| Q6 | | | FMC3 | TRANSISTOR | | |
| BA1 | | | W09-0514-05 | LITHIUM BATTERY(CR2430) | | |
| IF UNIT (X48-3090-XX) -00 : TS-690S -01 : TS-450S | | | | | | |
| Z1 | | * | X59-3030-03 | MODULE UNIT(NOTCH) | | |
| Z2 | | * | X59-3920-00 | MODULE UNIT(SEL) | | |
| Z3 | | | X59-3680-01 | MODULE UNIT(TRX) | | |
| Z4 | | * | X59-3930-00 | MODULE UNIT(BK-IN) | | |
| Z5 | | | X59-3860-00 | MODULE UNIT(DELAY) | | |
| Z6 | | | X59-1060-00 | MODULE UNIT(SIDE TONE) | | |
| Z7 | | | X59-3000-03 | MODULE UNIT(FM MIC) | | |
| Z8 | | | X59-1080-00 | MODULE UNIT(VOX) | | |
| Z9 | | * | X59-3940-00 | MODULE UNIT(METER) | | |
| C1 ,2 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C3 | | | CK73FB1E473K | CHIP C 0.047UF K | | |
| C4 ,5 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C6 | | | CK73FB1E473K | CHIP C 0.047UF K | | |
| C7 -19 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C20 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C21 -27 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C28 | | | CC73FCH1H050C | CHIP C 5PF C | | |
| C29 ,30 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C31 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C32 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C33 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C34 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C35 | | | CE04EW1C100M | ELECTRO 10UF 16WV | | |
| C36 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C37 | | | CC73FCH1H101J | CHIP C 100PF J | | |
| C38 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C39 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C40 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C41 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C42 | | | CK73FB1E473K | CHIP C 0.047UF K | | |
| C43 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C44 | | | CE04EW1A471M | ELECTRO 470UF 10WV | | |
| C45 | | | CC73FCH1H101J | CHIP C 100PF J | | |
| C46 -48 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C49 | | | CC73FSL1H221J | CHIP C 220PF J | | |
| C50 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C51 | | | CE04EW1A101M | ELECTRO 100UF 10WV | | |
| C52 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C53 ,54 | | | CE04EW1A101M | ELECTRO 100UF 10WV | | |
| C55 | | | CK73FB1E473K | CHIP C 0.047UF K | | |
| C56 -59 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C60 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C61 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C62 | | | CK73FB1E223K | CHIP C 0.022UF K | | |
| C63 | | | CC73FCH1H470J | CHIP C 47PF J | | |
| C64 | | | CE04EW1H010M | ELECTRO 1.0UF 50WV | | |
| C65 | | | CE04EW1H2R2M | ELECTRO 2.2UF 50WV | | |
| C66 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C67 ,68 | | | CC73FCH1H680J | CHIP C 68PF J | | |
| C69 ,70 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |

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M:Other Areas

⚠ indicates safety critical components

TS-450S/690S

PARTS LIST

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IF UNIT (X48-3090-XX)

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C71 | | | C90-2046-05 | ELECTR0 22UF 10WV | | |
| C72 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C73 | | | CK73FB1H222K | CHIP C 2200PF K | | |
| C74 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C75 | | | CC73FSL1H121J | CHIP C 120PF J | | |
| C76 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C77 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C78 | | | CK73FB1H472K | CHIP C 4700PF K | | |
| C79 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C80 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C81 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C82 | | | CC73FCH1H470J | CHIP C 47PF J | | |
| C83 | | | CC73FSL1H221J | CHIP C 220PF J | | |
| C84 , 85 | | | CE04EW1HR47M | ELECTR0 0.47UF 50WV | | |
| C86 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C87 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C88 | | | CC73FSL1H391J | CHIP C 390PF J | | |
| C89 | | | CC73FSL1H821J | CHIP C 820PF J | | |
| C90 | | | CC73FSL1H391J | CHIP C 390PF J | | |
| C91 , 92 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C93 | | | CK73FB1E104K | CHIP C 0.10UF K | | |
| C94 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C95 | | | CK73FB1E104K | CHIP C 0.10UF K | | |
| C96 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C97 | | | CK73FB1H472K | CHIP C 4700PF K | | |
| C98 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C99 | | | CE04EW1E331M | ELECTR0 330UF 25WV | | |
| C100 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C101 | | | CE04LW0J471M | ELECTR0 470UF 6.3WV | | |
| C102 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C103 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C104 | | | C90-2153-05 | ELECTR0 470UF 10WV | | |
| C105 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C106 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C107 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C108 | | | CC73FCH1H180J | CHIP C 18PF J | | |
| C109 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C110, 111 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C112 | | | CC73FCH1H470J | CHIP C 47PF J | | |
| C113 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C114 | | | CE04EW1E4R7M | ELECTR0 4.7UF 25WV | | |
| C115 | | | CE04EW1H010M | ELECTR0 1.0UF 50WV | | |
| C116 | | | CE04EW1H0R1M | ELECTR0 0.1UF 50WV | | |
| C117 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C118 | | | CE04EW1H010M | ELECTR0 1.0UF 50WV | | |
| C119 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C120 | | | CE04EW1E4R7M | ELECTR0 4.7UF 25WV | | |
| C121 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C122 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C123 | | | CE04EW1A470M | ELECTR0 47UF 10WV | | |
| C124 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C125 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C126 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C127 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C128 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C129 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C130 | | | CC73FSL1H471J | CHIP C 47PF J | | |
| C131 | | | CK73FB1E223K | CHIP C 0.022UF K | | |
| C132 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C133 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C134 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C135-137 | | | CK73FB1E104K | CHIP C 0.10UF K | | |
| C136, 137 | | | CK73FB1E104K | CHIP C 0.10UF K | | |
| C138 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C139 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C140 | | | CK73FB1E473K | CHIP C 0.047UF K | | |
| C141 | | | CC73FCH1H101J | CHIP C 100PF J | | |
| C142 | | | CK73FB1E104K | CHIP C 0.1UF K | | |
| C143, 144 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C145 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C146 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C147 | | | CE04EW1A220M | ELECTR0 2.2UF 10WV | | |
| C148 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C149 | | | CK73FB1E104K | CHIP C 0.10UF K | | |
| C150 | | | CE04EW1A470M | ELECTR0 47UF 10WV | | |
| C151 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C152 | | | CE04EW1A470M | ELECTR0 47UF 10WV | | |
| C153 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C154 | | | CE04EW1C220M | ELECTR0 22UF 16WV | | |
| C155 | | | CE04EW1H2R2M | ELECTR0 2.2UF 50WV | | |
| C156 | | | CE04EW1H010M | ELECTR0 1.0UF 50WV | | |
| C157 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C158 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C159-162 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C163 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C164 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C165 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C166 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C167 | | | CE04EW1E4R7M | ELECTR0 4.7UF 25WV | | |
| C168 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C169 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C170, 171 | | | CE04EW1E4R7M | ELECTR0 4.7UF 25WV | | |
| C172, 173 | | | CC73FCH1H101J | CHIP C 100PF J | | |
| C174 | | | CK73FB1H222K | CHIP C 2200PF K | | |
| C175 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| C176 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C177 | | | CC73FCH1H101J | CHIP C 100PF J | | |
| C178 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C179 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C180 | | | CK73FB1E473K | CHIP C 0.047UF K | | |
| C181 | | | CE04EW1C100M | ELECTR0 10UF 16WV | | |
| C183 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C184 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C185 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C186, 187 | | | CE04EW1E4R7M | ELECTR0 4.7UF 25WV | | |
| C188 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C189 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C190 | | | CE04EW1E4R7M | ELECTR0 4.7UF 25WV | | |
| C191 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C192, 193 | | | CK73FB1H102K | CHIP C 1000PF K | | |

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|--|---------------|-------------------|---|--|------------------------|--------------------|
| C194 C195-198 C199-203 C204 C205 | | * | CK45FE2H222P CK73FB1E103K CK73FB1H102K CK73FB1E104K CK73FB1E123K | CERAMIC 2200PF P CHIP C 0.01UF K CHIP C 1000PF K CHIP C 0.10UF K CHIP C 0.012UF K | | |
| C206-208 C209 C210 C211 C212 | | | CK73FB1E103K CE04EW1C100M CE04EW1A101M CE04EW1A470M CE04EW1C100M | CHIP C 0.01UF K ELECTRO 10UF 16WV ELECTRO 100UF 10WV ELECTRO 47UF 10WV ELECTRO 10UF 16WV | | |
| C213 C214 C215 C216 C217 | | | CK73FB1H102K CE04EW1HR47M CK73FB1E103K CE04EW1A101M CC73FCH1H101J | CHIP C 1000PF K ELECTRO 0.47UF 50WV CHIP C 0.01UF K ELECTRO 100UF 10WV CHIP C 100PF J | | |
| C218 C219, 220 C221 C222 C223 | | | CE04EW1A101M CK73FF1C105Z CE04EW1C100M CK73FB1E103K CE04EW1H4R7M | ELECTRO 100UF 10WV CHIP C 1.0UF Z ELECTRO 10UF 16WV CHIP C 0.01UF K ELECTRO 4.7UF 50WV | | |
| C224 C225 C227 | | | CK73FB1E103K CE04NW1C220M CK73FB1E103K | CHIP C 0.01UF K ELECTRO 22UF 16WV CHIP C 0.01UF K | | |
| CN1 CN2 , 3 CN4 CN5 CN6 | | | E40-5348-05 E40-3237-05 E40-3241-05 E40-5066-05 E40-3240-05 | PIN CONNECTOR (15P STRAIGHT) PIN CONNECTOR (2P) PIN CONNECTOR (6P) PIN CONNECTOR (9P) PIN CONNECTOR (5P) | | |
| CN7 CN8 CN9 CN10 CN11 | | * | E40-5426-05 E40-3241-05 E40-3237-05 E40-3241-05 E40-3239-05 | PIN CONNECTOR (20P STRAIGHT) PIN CONNECTOR (6P) PIN CONNECTOR (2P) PIN CONNECTOR (6P) PIN CONNECTOR (4P) | | |
| CN12 CN13 CN14, 15 CN16 CN17, 18 | | | E40-3237-05 E40-3238-05 E40-3237-05 E40-3241-05 E40-5059-05 | PIN CONNECTOR (2P) PIN CONNECTOR (3P) PIN CONNECTOR (2P) PIN CONNECTOR (6P) PIN CONNECTOR (OPTION FILTER) | | |
| J1 J2 J3 J4 J5 | | | E11-0414-05 E06-1352-05 E06-0752-05 E11-0438-05 E06-1352-05 | PHONE JACK (EXT.SP) CYLINDRICAL RECEPTACLE(PACKET CYLINDRICAL RECEPTACLE(REMOTE PHONE JACK (KYE) CYLINDRICAL RECEPTACLE(PACKET | | |
| J6 , 7 | | | E13-0166-05 | PHONE JACK (DSP2) | | |
| A1 A2 A3 , 4 A5 , 6 | | * | F01-0989-04 G02-0574-04 J32-0761-04 N30-3010-46 | HEAT SINK FLAT SPRING STUD PAN HEAD MACHINE SCREW | | |
| CF1 CF2 CF3 L1 L2 -4 | | | L72-0315-05 L72-0319-05 L72-0371-05 L34-2121-05 L33-0712-05 | CERAMIC FILTER 12KHZ CERAMIC FILTER 6KHZ CERAMIC FILTER 2.4KHZ COIL CHOKE COIL 6.8UH | | |

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| L5 | | * | L34-2005-05 | COIL | | |
| L6 | | | L34-2124-05 | COIL | | |
| L7 | | | L34-0945-05 | COIL | | |
| L8 | | | L33-0712-05 | CHOKE COIL | 6.8UH | |
| L9 | | | L34-4015-05 | COIL | | |
| L10 ,11 | | | L40-1021-15 | SMALL FIXED INDUCTOR | 1MH | |
| L12 | | | L40-1092-12 | SMALL FIXED INDUCTOR | 1UH | |
| L13 | | | L40-1021-15 | SMALL FIXED INDUCTOR | 1MH | |
| L14 | | | L40-1011-15 | SMALL FIXED INDUCTOR | 100UH | |
| L15 | | | L40-1021-15 | SMALL FIXED INDUCTOR | 1MH | |
| L16 | | | L40-1011-15 | SMALL FIXED INDUCTOR | 100UH | |
| L17 | | | L40-1001-15 | SMALL FIXED INDUCTOR | 10UH | |
| L18 | | | L40-4701-15 | SMALL FIXED INDUCTOR | 47UH | |
| L19 ,20 | | | L40-1011-12 | SMALL FIXED INDUCTOR | 100UH | |
| L21 -23 | | | L40-1011-15 | SMALL FIXED INDUCTOR | 100UH | |
| R1 | | | RK73FB2A103J | CHIP R | 10K J 1/10W | |
| R2 | | | RK73FB2A333J | CHIP R | 33K J 1/10W | |
| R3 | | | RK73FB2A104J | CHIP R | 100K J 1/10W | |
| R4 | | | RK73FB2A471J | CHIP R | 470 J 1/10W | |
| R5 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R6 | | | RK73FB2A102J | CHIP R | 1.0K J 1/10W | |
| R7 | | | RK73FB2A152J | CHIP R | 1.5K J 1/10W | |
| R8 | | | RK73FB2A471J | CHIP R | 470 J 1/10W | |
| R9 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R10 | | | RK73FB2A272J | CHIP R | 2.7K J 1/10W | |
| R11 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R12 | | | RK73FB2A272J | CHIP R | 2.7K J 1/10W | |
| R13 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R14 | | | RK73FB2A472J | CHIP R | 4.7K J 1/10W | |
| R15 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R16 | | | RK73FB2A272J | CHIP R | 2.7K J 1/10W | |
| R17 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R18 | | | RK73FB2A472J | CHIP R | 4.7K J 1/10W | |
| R19 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R20 | | | RK73FB2A272J | CHIP R | 2.7K J 1/10W | |
| R21 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R22 | | | RK73FB2A272J | CHIP R | 2.7K J 1/10W | |
| R23 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R24 | | | RK73FB2A272J | CHIP R | 2.7K J 1/10W | |
| R25 | | | RK73FB2A473J | CHIP R | 47K J 1/10W | |
| R26 | | | RK73FB2A152J | CHIP R | 1.5K J 1/10W | |
| R27 | | | RK73FB2A473J | CHIP R | 47K J 1/10W | |
| R28 ,29 | | | RK73FB2A152J | CHIP R | 1.5K J 1/10W | |
| R30 | | | RK73FB2A103J | CHIP R | 10K J 1/10W | |
| R31 | | | RK73FB2A333J | CHIP R | 33K J 1/10W | |
| R32 | | | RK73FB2A104J | CHIP R | 100K J 1/10W | |
| R33 | | | RK73FB2A471J | CHIP R | 470 J 1/10W | |
| R34 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R35 | | | RK73FB2A472J | CHIP R | 4.7K J 1/10W | |
| R36 | | | RK73FB2A103J | CHIP R | 10K J 1/10W | |
| R37 | | | RK73FB2A332J | CHIP R | 3.3K J 1/10W | |
| R38 | | | RK73FB2A102J | CHIP R | 1.0K J 1/10W | |
| R39 | | | RK73FB2A101J | CHIP R | 100 J 1/10W | |
| R40 | | | RK73FB2A333J | CHIP R | 33K J 1/10W | |
| R41 | | | RK73FB2A104J | CHIP R | 100K J 1/10W | |

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TS-450S/690S

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|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| R42 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R43 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R44 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R45 , 46 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R47 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R48 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R49 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R50 | | | RK73FB2A334J | CHIP R 330K J 1/10W | | |
| R51 , 52 | | | RK73FB2A105J | CHIP R 1.0M J 1/10W | | |
| R53 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R54 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R55 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R56 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R57 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R58 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R59 | | | RK73FB2A682J | CHIP R 6.8K J 1/10W | | |
| R60 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R61 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R62 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R63 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R64 | | | RK73FB2A392J | CHIP R 3.9K J 1/10W | | |
| R65 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R66 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R67 | | | RK73FB2A681J | CHIP R 680 J 1/10W | | |
| R68 | | | RK73FB2A121J | CHIP R 120 J 1/10W | | |
| R69 | | | RK73FB2A221J | CHIP R 220 J 1/10W | 450S | |
| R70 | | | RK73FB2A560J | CHIP R 56 J 1/10W | | |
| R71 -74 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R75 -78 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R79 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R80 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R81 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R82 | | | RK73FB2A183J | CHIP R 18K J 1/10W | | |
| R83 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R84 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R85 | | | RK73FB2A272J | CHIP R 2.7K J 1/10W | | |
| R86 | | | RK73FB2A392J | CHIP R 3.9K J 1/10W | | |
| R87 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R88 | | | RK73FB2A153J | CHIP R 15K J 1/10W | | |
| R89 | | | RK73FB2A334J | CHIP R 330K J 1/10W | | |
| R90 , 91 | | | RK73FB2A153J | CHIP R 15K J 1/10W | | |
| R92 -94 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R95 | | | RK73FB2A105J | CHIP R 1.0M J 1/10W | | |
| R96 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R97 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R98 | | | RK73FB2A273J | CHIP R 27K J 1/10W | | |
| R99 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R100, 101 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R102 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R103 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R104 | | | RK73FB2A335J | CHIP R 3.3M J 1/10W | | |
| R105 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R106 | | | RK73FB2A153J | CHIP R 15K J 1/10W | | |
| R107, 108 | | | RK73FB2A123J | CHIP R 12K J 1/10W | | |
| R109 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |

L:Scandinavia

K:USA

P:Canada

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

Y:PX(Far East, Hawaii)

T:England

E:Europe

V:AAFES(Europe)

X:Australia

M:Other Areas

△ indicates safety critical components.

PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

IF UNIT (X48-3090-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| R110, 111 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R112 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R113 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R114 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R115 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R116 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R117 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R118 | | | RK73FB2A151J | CHIP R 150 J 1/10W | | |
| R119 | | | RK73FB2A821J | CHIP R 820 J 1/10W | | |
| R120 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R121 | | | RK73FB2A332J | CHIP R 3.3K J 1/10W | | |
| R122 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R123 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R124 | | | RK73FB2A331J | CHIP R 330 J 1/10W | | |
| R125, 126 | | | RK73FB2A2R2J | CHIP R 2.2 J 1/10W | | |
| R127 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R128 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R129 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R130 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R131 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R132 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R133 | | | RK73FB2A334J | CHIP R 330K J 1/10W | | |
| R134 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R135 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R136 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R137 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R138 | | | RK73FB2A105J | CHIP R 1.0M J 1/10W | | |
| R139 | | | RK73FB2A684J | CHIP R 680K J 1/10W | | |
| R140 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R141 | | | RK73FB2A335J | CHIP R 3.3M J 1/10W | | |
| R142 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R143 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R144 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R145 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R146 | | | RK73FB2A474J | CHIP R 470K J 1/10W | | |
| R147 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R148 | | | RK73FB2A153J | CHIP R 15K J 1/10W | | |
| R149 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R150 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R151 | | | RK73FB2A332J | CHIP R 3.3K J 1/10W | | |
| R152 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R153 | | | RK73FB2A821J | CHIP R 820 J 1/10W | | |
| R154 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R155 | | | RK73FB2A123J | CHIP R 12K J 1/10W | | |
| R156 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R157 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R158 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R159 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R160 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R161 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R162 | | | RK73FB2A334J | CHIP R 330K J 1/10W | | |
| R163 | | | RK73FB2A124J | CHIP R 120K J 1/10W | | |
| R164 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R165 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R166 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |

L:Scandinavia

K:USA

P:Canada

TS-450S : K,X,P,E,E2,M,M2

Y:PX(Far East, Hawaii)

T:England

E:Europe

TS-690S : K,X,P,E,E2,M

Y:AAFES(Europe)

X:Australia

M:Other Areas

△ indicates safety critical components.

TS-450S/690S

PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

IF UNIT (X48-3090-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|--|---------------|-------------------|--|--|------------------------|--------------------|
| R167, 168 R169 R170 R171 R172 | | | RK73FB2A471J RK73FB2A224J RK73FB2A333J RK73FB2A224J RK73FB2A472J | CHIP R 470 J 1/10W CHIP R 220K J 1/10W CHIP R 33K J 1/10W CHIP R 220K J 1/10W CHIP R 4.7K J 1/10W | | |
| R173, 174 R175, 176 R177 R178 R179 | | | RK73FB2A101J RK73FB2A103J RK73FB2A102J RK73FB2A222J RK73FB2A332J | CHIP R 100 J 1/10W CHIP R 10K J 1/10W CHIP R 1.0K J 1/10W CHIP R 2.2K J 1/10W CHIP R 3.3K J 1/10W | | |
| R180 R181 R182 R183 R184 | | | RK73FB2A101J RK73FB2A222J RK73FB2A124J RK73FB2A101J RK73FB2A223J | CHIP R 100 J 1/10W CHIP R 2.2K J 1/10W CHIP R 120K J 1/10W CHIP R 100 J 1/10W CHIP R 22K J 1/10W | | |
| R185 R186 R187, 188 R189 R190 | | | RK73FB2A221J RK73FB2A471J RK73FB2A103J RK73FB2A472J RK73FB2A103J | CHIP R 220 J 1/10W CHIP R 470 J 1/10W CHIP R 10K J 1/10W CHIP R 4.7K J 1/10W CHIP R 10K J 1/10W | | |
| R191 R192 R193 R194-195 R196 | | | RK73FB2A104J RK73FB2A471J RK73FB2A104J RK73FB2A103J RK73FB2A472J | CHIP R 100K J 1/10W CHIP R 470 J 1/10W CHIP R 100K J 1/10W CHIP R 10K J 1/10W CHIP R 4.7K J 1/10W | | |
| R197-199 R200 R201, 202 R203 R204 | | | RK73FB2A104J RK73FB2A123J RK73FB2A104J RK73FB2A222J RK73FB2A104J | CHIP R 100K J 1/10W CHIP R 12K J 1/10W CHIP R 100K J 1/10W CHIP R 2.2K J 1/10W CHIP R 100K J 1/10W | | |
| R205 R206-208 R209 R210 R211 | | | RK73FB2A153J RK73FB2A222J RK73FB2A103J RK73FB2A104J RK73FB2A103J | CHIP R 15K J 1/10W CHIP R 2.2K J 1/10W CHIP R 10K J 1/10W CHIP R 100K J 1/10W CHIP R 10K J 1/10W | | |
| R212 R213 R214 R215 R216 | | | RK73FB2A222J RK73FB2A103J RK73FB2A104J RK73FB2A333J RK73FB2A223J | CHIP R 2.2K J 1/10W CHIP R 10K J 1/10W CHIP R 100K J 1/10W CHIP R 33K J 1/10W CHIP R 22K J 1/10W | | |
| R217 R218, 219 R220 R221 R222 | | | RK73FB2A472J RK73FB2A103J RK73FB2A104J RK73FB2A562J RK73FB2A022J | CHIP R 4.7K J 1/10W CHIP R 10K J 1/10W CHIP R 100K J 1/10W CHIP R 5.6K J 1/10W CHIP R 8.2K J 1/10W | | |
| R223 R224 R225 R226 R227 | | | RK73FB2A023J RK73FB2A472J RK73FB2A101J RK73FB2A472J RK73FB2A332J | CHIP R 82K J 1/10W CHIP R 4.7K J 1/10W CHIP R 100 J 1/10W CHIP R 4.7K J 1/10W CHIP R 3.3K J 1/10W | | |
| R228 R229 R230 R231 R232 | | | RK73FB2A101J RK73FB2A474J RK73FB2A101J RK73FB2A021J RK73FB2A223J | CHIP R 100 J 1/10W CHIP R 470K J 1/10W CHIP R 100 J 1/10W CHIP R 820 J 1/10W CHIP R 22K J 1/10W | | |

L:Scandinavia

K:USA

P:Canada

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

Y:PX(Far East, Hawaii)

T:England

E:Europe

Y:AAFES(Europe)

X:Australia

M:Other Areas

 indicates safety critical components

PARTS LIST

× New Parts

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Teile ohne Parts No. werden nicht geliefert.

IF UNIT (X48-3090-XX)

| Ref. No. 参照番号 | Address 位 置 | New Parts 新 | Parts No. 部 品 番 号 | Description 部 品 名 / 規 格 | Desti- nation 仕 向 | Re- marks 備考 |
|------------------|----------------|-------------------|----------------------|----------------------------|-------------------------|--------------------|
| R233 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R234 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R235-237 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R238 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R239 | | | RK73FB2A335J | CHIP R 3.3M J 1/10W | | |
| R240 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R241 | | | RK73FB2A824J | CHIP R 820K J 1/10W | | |
| R242 | | | RK73FB2A564J | CHIP R 560K J 1/10W | | |
| R243 | | | RK73FB2A822J | CHIP R 8.2K J 1/10W | | |
| R244 | | | RK73FB2A272J | CHIP R 2.7K J 1/10W | | |
| R245 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R246 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R247 | | | R92-0670-05 | CHIP R 0 0HM | | |
| R248 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R249 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R250 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R251 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R252 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R253 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R254 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R255, 256 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R257 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R258 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R259 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R260 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R261 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R262 | | | RK73FB2A225J | CHIP R 2.2M J 1/10W | | |
| R263 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R264 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R265 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R266 | | | RK73FB2A152J | CHIP R 1.5K J 1/10W | | |
| R267 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R269 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R270 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R271 | | | RK73FB2A822J | CHIP R 8.2K J 1/10W | 690S | |
| R273 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R275 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R276 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R277 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R278 | | | RK73FB2A153J | CHIP R 15K J 1/10W | | |
| R279 | | | RK73FB2A272J | CHIP R 2.7K J 1/10W | | |
| R280 | | * | RD14CB2E102J | RD 1.0K J 1/4W | | |
| R281 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R282 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R283 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R284, 285 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R286 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R287 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R288 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R289 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R290 | | | RK73FB2A561J | CHIP R 560 J 1/10W | | |
| R291, 292 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R293, 294 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R295 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R297 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |

L:Scandinavia

K:USA

P:Canada

Y:PX(Far East, Hawaii)

T:England

E:Europe

Y:AAFES(Europe)

X:Australia

M:Other Areas

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

A indicates safety critical components.

TS-450S/690S

PARTS LIST

* New Parts

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IF UNIT (X48-3090-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名/規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| VR1 | | * | R12-6738-05 | TRIMMING POT. 4.7K(IF) | | |
| VR2 | | | R12-6740-05 | TRIMMING POT. 10K(NOTCH) | | |
| VR3 | | * | R12-6738-05 | TRIMMING POT. 4.7K(IF) | | |
| VR4 | | | R12-6744-05 | TRIMMING POT. 47K(FM SM) | | |
| VR5 | | * | R12-6734-05 | TRIMMING POT. 1K(REF) | | |
| VR6 | | | R12-6744-05 | TRIMMING POT. 47K(FM SM) | | |
| VR7 | | * | R12-6734-05 | TRIMMING POT. 1K(SIDE TONE) | | |
| VR8 | | * | R12-6738-05 | TRIMMING POT. 4.7K(IF) | | |
| VR9 | | | R12-6740-05 | TRIMMING POT. 10K(NOTCH) | | |
| VR10 | | | R12-6742-05 | TRIMMING POT. 22K(RF GAIN) | | |
| VR11-13 | | | R12-6740-05 | TRIMMING POT. 10K(NOTCH) | | |
| VR14 | | | R12-6740-05 | TRIMMING POT. 10K(ALC) | | |
| VR15 ,16 | | | R12-6744-05 | TRIMMING POT. 47K(VSF) | | |
| VR17 | | | R12-6746-05 | TRIMMING POT. 100K(50M 50W) | 690S | |
| VR18 | | * | R12-6732-05 | TRIMMING POT. 470(MIN) | | |
| VR19 | | * | R12-6748-05 | TRIMMING POT. 220K(50W) | | |
| VR20 | | * | R12-6746-05 | TRIMMING POT. 100K(50W) | | |
| VR21 ,22 | | | R12-6744-05 | TRIMMING POT. 47K(FM SM) | | |
| VR23 | | | R12-6740-05 | TRIMMING POT. 10K(NOTCH) | | |
| VR24 | | | R12-3410-05 | TRIMMING POT. 10K | | |
| VR25 | | * | R12-0443-05 | TRIMMING POT. 330 | | |
| K1 | | | S51-1420-05 | RELAY | | |
| S1 | | | S31-1411-05 | SLIDE SWITCH | | |
| D1 ,2 | | | RLS135 | DIODE | | |
| D3 ,4 | | | DAP236(K) | DIODE | | |
| D5 -13 | | | RLS135 | DIODE | | |
| D14 | | | DAN202K | DIODE | | |
| D15 | | | 1N60 | DIODE | | |
| D16 -18 | | | RLS73 | DIODE | | |
| D19 | | | RLZ5.1A | DIODE | | |
| D20 | | | RLS73 | DIODE | | |
| D21 | | | HSM88AS | DIODE | | |
| D22 | | | DAP202(K) | DIODE | | |
| D23 | | | DAN202K | DIODE | | |
| D24 ,25 | | | RLS73 | DIODE | | |
| D26 | | | HSM88AS | DIODE | | |
| D27 ,28 | | | RLS73 | DIODE | | |
| D29 | | | DAN202K | DIODE | | |
| D30 ,31 | | | HSM88AS | DIODE | | |
| D32 | | | LFB01 | DIODE | | |
| D33 | | | RLS73 | DIODE | | |
| D34 ,35 | | | RLS135 | DIODE | | |
| D36 | | | MI204 | DIODE | | |
| D37 -39 | | | RLS73 | DIODE | | |
| D40 | | | DAN202K | DIODE | | |
| D41 | | | RLS73 | DIODE | | |
| D42 | | | RLZ5.1A | DIODE | | |
| D43 -45 | | | RLS73 | DIODE | | |
| D46 | | | DAN202K | DIODE | | |
| D48 -54 | | | RLS73 | DIODE | | |
| D55 | | | DAP202(K) | DIODE | | |
| D56 | | | DAN202K | DIODE | | |
| D57 | | | RLS73 | DIODE | | |

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PARTS LIST

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IF UNIT (X48-3090-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|---|---------------|-------------------|---|---|------------------------|--------------------|
| D58 ,59 D60 D61 D62 D63 | | * | DAN202K 1SS101 RLS73 RLZ9.1B RLS73 | DIODE DIODE DIODE DIODE DIODE | 450S | |
| D64 D65 D66 ,67 D69 D71 | | * | RLZ3.6B RLZ13B DAN202K DAN202K RLS73 | DIODE DIODE DIODE DIODE DIODE | | |
| D72 D73 D74 D77 IC1 | | | RLS73 MA110 RLS73 RLS73 UPC1037HA | DIODE DIODE DIODE DIODE IC(DUBBLE BALANCE MODULATOR) | | |
| IC2 IC3 IC4 IC5 IC6 | | | TC4066BF TC9174F MC3361D UPC2002V NJM2904M | IC(BILATERAL SWITCH X4) IC(CMOS I/O) IC(FM IF SYSTEM) IC(OP AMP X2) IC(OP AMP X2) | | |
| IC7 IC8 IC9 IC10 IC11,12 | | | TC4066BF AN612 TC4S66F TC9174F TC4066BF | IC(BILATERAL SWITCH X4) IC(BALANCE MODULATOR) IC(BILATERAL SWITCH) IC(CMOS I/O) IC(BILATERAL SWITCH X4) | | |
| IC13,14 IC15 IC16 Q1 Q2 ,3 | | * | TC4S66F UPC1313HA NJM2902M DTC114EK 3SK131(M) | IC(BILATERAL SWITCH) IC IC(OP AMP X4) DIGITAL TRANSISTOR FET | | |
| Q4 ,5 Q6 ,7 Q8 Q9 ,10 Q11 | | | FMC2 DTC114EK 3SK131(M) 2SC2712(Y) 2SA1213(Y) | TRANSISTOR DIGITAL TRANSISTOR FET TRANSISTOR TRANSISTOR | | |
| Q12 Q13 Q14 Q15 Q16 | | | DTC124EK DTA124EK DTC114EK DTA124EK DTA124EK | DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR | 450S | |
| Q17 Q18 Q19 -21 Q22 -24 Q25 | | | DTC114EK DTA124EK FMA5 2SC2712(Y) 2SK210(GR) | DIGITAL TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR TRANSISTOR FET | 690S | |
| Q26 Q27 Q28 Q29 ,30 Q31 | | | 2SA1162(Y) DTC114EK DTA124EK 2SC2712(Y) 2SD1757K(S) | TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR TRANSISTOR | | |
| Q32 ,33 Q34 Q35 Q36 Q37 | | | 2SC2712(Y) DTC124EK FMC2 2SC2712(Y) DTC114EK | TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR | | |

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TS-450S/690S

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IF UNIT (X48-3090-XX)

PLL UNIT (X50-3150-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕 向 | Re- marks 備考 |
|--|---------------|-------------------|---|--|-------------------------|--------------------|
| Q38 ,39 Q40 Q41 Q42 Q43 | | | 2SC2712(Y) DTA124EK DTC114EK DTD114EK 2SC3722K(S) | TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR | | |
| Q44 Q45 Q46 Q47 Q48 | | | DTA124EK DTA143EK DTA124EK DTC124EK DTC114EK | DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR | | |
| Q49 Q50 ,51 Q52 Q53 ,54 Q55 | | | FMC2 DTC114EK 2SA1162(Y) DTC114EK DTA114EK | TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR | | |
| Q56 Q57 Q58 Q59 Q60 | | | 2SA1162(Y) DTC114EK DTA143EK DTC114EK 2SC2712(Y) | TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR | 690S | |
| Q61 ,62 Q63 ,64 Q65 Q68 ,69 Q70 | | | DTA124EK DTC114EK DTB123EK IMH5 DTC114EK | DIGITAL TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR | | |
| Q71 Q72 Q73 Q74 ,75 Q76 | | | DTC114EK FMC3 2SC2712(Y) DTC114EK DTA124EK | DIGITAL TRANSISTOR TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR | 690 | |
| TH1 TH2 | | | 157-501-53009 157-502-53002 | THERMISTOR 500 THERMISTOR 5K | | |
| PLL UNIT (X50-3150-XX) -00 : TS-690S -01 : TS-450S | | | | | | |
| C1 C2 C3 C4 C5 | | | CC73FUJ1H470J CK73FB1E103K CE04EW1A470M CC73FCH1H151J CC73FCH1H390J | CHIP C 47PF J CHIP C 0.01UF K ELECTRO 47UF 10WV CHIP C 150PF J CHIP C 39PF J | | |
| C6 C7 C8 C9 C10 -17 | | | CC73FCH1H020C CK73FB1E103K CE04EW1A470M CC73FCH1H050C CK73FB1E103K | CHIP C 2.0PF C CHIP C 0.01UF K ELECTRO 47UF 10WV CHIP C 5PF C CHIP C 0.01UF K | | |
| C18 C19 C21 C22 C23 | | | CC73FCH1H820J CC73FSL1H101J CK73FB1E103K CK73FB1H102K CK73FB1H222K | CHIP C 82PF J CHIP C 100PF J CHIP C 0.01UF K CHIP C 1000PF K CHIP C 2200PF K | | |
| C24 C25 C26 C27 C28 | | | CK73FB1E103K CE04EW1A470M CK73FF1E104Z CK73FB1E103K CK73FF1E104Z | CHIP C 0.01UF K ELECTRO 47UF 10WV CHIP C 0.1UF Z CHIP C 0.01UF K CHIP C 0.1UF Z | | |
| C29 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | |

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|------------------|---------------|-------------------|-------------------|-------------------------|-------------------------|--------------------|
| C30 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C31 | | | CE04EW1A471M | ELECTR 470UF 10WV | | |
| C32 -35 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C36 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C37 | | | CE04EW1A471M | ELECTR 470UF 10WV | | |
| C38 | | | C91-0119-05 | CERAMIC 0.047UF K | | |
| C39 | | | CC73FRH1H680J | CHIP C 68PF J | | |
| C40 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C41 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C42 ,43 | | | CC73FCH1H120J | CHIP C 12PF J | | |
| C44 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C45 | | | CC73FRH1H680J | CHIP C 68PF J | | |
| C46 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C47 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C48 | | | CC73FCH1H120J | CHIP C 12PF J | | |
| C49 | | | CC73FCH1H150J | CHIP C 15PF J | | |
| C50 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C52 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C53 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C54 | | | CC73FCH1H100D | CHIP C 10PF D | | |
| C55 | | | CC73FCH1H150J | CHIP C 15PF J | | |
| C56 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C57 | | | CC73FRH1H820J | CHIP C 82PF J | 690S | |
| C58 | | | CC73FCH1H330J | CHIP C 33PF C | 690S | |
| C59 | | | CK73FB1H102K | CHIP C 1000PF K | 690S | |
| C60 | | | CC73FCH1H050C | CHIP C 5PF C | 690S | |
| C61 | | | CC73FCH1H080D | CHIP C 8PF D | 690S | |
| C62 | | | CK73FB1H102K | CHIP C 1000PF K | 690S | |
| C63 | | | C91-0119-05 | CERAMIC 0.047UF K | | |
| C64 -66 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C67 | | | CC73FCH1H010C | CHIP C 1PF C | | |
| C68 | | | CC73FCH1H0R5C | CHIP C 0.5PF C | | |
| C69 ,70 | | | CC73FCH1H070D | CHIP C 7PF D | | |
| C72 -77 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C78 -81 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C82 | | | CC73FB1H102K | CHIP C 1000PF K | | |
| C83 | | | CC73FCH1H220J | CHIP C 22PF J | | |
| C84 | | | CC73FCH1H020C | CHIP C 2.0PF C | | |
| C85 | | | CC73FCH1H010C | CHIP C 1PF C | | |
| C86 | | | CC73FCH1H090D | CHIP C 9PF D | | |
| C87 | | | CC73FCH1H030C | CHIP C 3PF C | | |
| C88 | | | CC73FCH1H020C | CHIP C 2.0PF C | | |
| C89 | | | CC73FCH1H470J | CHIP C 47PF J | | |
| C90 | | | CC73FCH1H220J | CHIP C 22PF J | | |
| C91 | | | CC73FCH1H470J | CHIP C 47PF J | | |
| C92 -95 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C96 | | | CC73FCH1H220J | CHIP C 22PF J | | |
| C97 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C98 | | | CE04EW1A470M | ELECTR 47UF 10WV | | |
| C99 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C100,101 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C102 | | | CQ92M1H103K | MYLAR 0.010UF K | | |
| C103 | | | C91-1083-05 | FILM 0.47UF 63WV | | |
| C104 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C105 | | | CE04EW1A101M | ELECTR 100UF 10WV | | |

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TS-450S/690S

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PLL UNIT (X50-3150-XX)

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|------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| C106 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C107 | | | CE04EW1A331M | ELECTR0 330UF 10WV | | |
| C108-110 | | | CK73FB1H102K | CHIP C 1000PF M | | |
| C111 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C112 | | | CC73FCH1H080D | CHIP C 8PF D | | |
| C113 | | | CC73FCH1H680J | CHIP C 68PF J | | |
| C114 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C115 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C116 | | | CE04EW1A470M | ELECTR0 47UF 10WV | | |
| C117 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C118, 119 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C120 | | | CQ92M1H333K | MYLAR 0.033UF M | | |
| C121 | | | C91-1101-05 | FILM 0.22UF 63WV | | |
| C122 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C123 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C124 | | | CK45B1H102K | CERAMIC 1000PF K | | |
| C125 | | | C92-0003-05 | CHIP TAN 0.47UF 25WV | | |
| C126 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C127-130 | | | CC73FSL1H101J | CHIP C 100PF J | | |
| C131, 132 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C133 | | | CK73FB1H102K | CHIP C 1000PF K | 690S | |
| C134 | | | CK73FB1E103K | CHIP C 0.01UF K | 690S | |
| C135 | | | CC73FCH1H050C | CHIP C 5PF C | 690S | |
| C136 | | | CC73FCH1H040C | CHIP C 4PF C | 690S | |
| C137 | | | CC73FCH1H050C | CHIP C 5PF C | 690S | |
| C138-142 | | | CK73FB1E103K | CHIP C 0.01UF K | 690S | |
| C143-145 | | | CK73FB1H102K | CHIP C 1000PF K | 690S | |
| C146 | | | CC73FRH1H120J | CHIP C 12PF J | 690S | |
| C148 | | | CC73FRH1H120J | CHIP C 12PF J | 690S | |
| C149 | | | CK73FB1H102K | CHIP C 1000PF K | 690S | |
| C151 | | | CE04EW1A101M | ELECTR0 100UF 10WV | | |
| C152 | | | CC73FCH1H030C | CHIP C 3PF C | | |
| C153 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C154 | | | CC73FCH1H100D | CHIP C 10PF D | | |
| C155 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| TC1 | | | C05-0067-05 | TRIMMING CAP (25PF) | | |
| CN1 | | | E40-3237-05 | PIN CONNECTOR (2P) | | |
| CN2 | | | E40-5469-05 | PIN CONNECTOR (12P) | | |
| CN3 , 4 | | | E04-0154-05 | RF COAXIAL CABLE RECEPTACLE | | |
| CN5 | | | E40-3237-05 | PIN CONNECTOR (2P) | | |
| CN6 , 7 | | | E04-0154-05 | RF COAXIAL CABLE RECEPTACLE | | |
| CN8 | | | E40-3238-05 | PIN CONNECTOR (3P) | | |
| A1 | | | F11-1140-04 | SHIELDING CASE | | |
| A2 | | | F11-1141-04 | SHIELDING COVER | | |
| L1 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| L2 | | | L40-1501-17 | SMALL FIXED INDUCTOR | | |
| L3 | | | L40-1001-17 | SMALL FIXED INDUCTOR | | |
| L4 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| L5 | | | L34-4000-05 | COIL | | |
| L6 | | | L40-4791-19 | SMALL FIXED INDUCTOR | | |
| L7 | | * | L34-4286-05 | COIL | | |
| L8 | | | L40-4791-19 | SMALL FIXED INDUCTOR | | |
| L9 | | * | L34-4286-05 | COIL | | |

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|------------------|---------------|-------------------|-------------------|--------------------------|------------------------|--------------------|
| L10 | | * | L40-4791-19 | SMALL FIXED INDUCTOR | 690S | |
| L11 | | | L34-4287-05 | COIL | | |
| L12 | | | L40-4791-19 | SMALL FIXED INDUCTOR | | |
| L13 | | | L40-3982-17 | SMALL FIXED INDUCTOR | | |
| L14 | | | L34-1163-05 | COIL | | |
| L15 | | | L40-2292-17 | SMALL FIXED INDUCTOR | 690S | |
| L16 | | | L40-1592-17 | SMALL FIXED INDUCTOR | | |
| L17 ,18 | | | L40-1501-17 | SMALL FIXED INDUCTOR | | |
| L19 | | | L40-4701-17 | SMALL FIXED INDUCTOR | | |
| L21 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| L22 | | | L40-2282-17 | SMALL FIXED INDUCTOR | 690S | |
| L23 -25 | | | L40-4701-17 | SMALL FIXED INDUCTOR | | |
| L26 -28 | | | L40-4701-17 | SMALL FIXED INDUCTOR | | |
| L29 | | | L40-3991-17 | SMALL FIXED INDUCTOR | | |
| L30 | | | L40-4701-17 | SMALL FIXED INDUCTOR | | |
| L31 ,32 | | | L34-4222-05 | COIL | 690S | |
| L33 -35 | | | L33-0664-05 | CHOKE COIL | | |
| X1 | | | L77-0963-05 | CRYSTAL RESONATOR(20MHZ) | | |
| - | | | N30-26D4-41 | PAN HEAD MACHINE SCREW | | |
| R1 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R2 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R3 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R4 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R5 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R6 ,7 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R8 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R9 | | | RK73FB2A821J | CHIP R 820 J 1/10W | | |
| R10 ,11 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R12 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R13 | | | RK73FB2A103J. | CHIP R 10K J 1/10W | | |
| R14 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R15 ,16 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R17 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R18 | | | RK73FB2A153J | CHIP R 15K J 1/10W | | |
| R19 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R20 | | | RK73FB2A561J | CHIP R 560 J 1/10W | | |
| R23 | | | RK73FB2A272J | CHIP R 2.7K J 1/10W | | |
| R24 ,25 | | | RK73FB2A273J | CHIP R 27K J 1/10W | | |
| R26 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R27 | | | RK73FB2A471J | CHIP R 470 J 1/10W | 690S | |
| R28 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R29 -31 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R32 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R33 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R34 | | | RK73FB2A105J | CHIP R 1.0M J 1/10W | | |
| R35 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R36 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R37 ,38 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R39 | | | RK73FB2A105J | CHIP R 1.0M J 1/10W | | |
| R40 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R41 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R42 ,43 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R44 | | | RK73FB2A105J | CHIP R 1.0M J 1/10W | | |
| R45 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |

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PLL UNIT (X50-3150-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| R46 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R47 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R48 | | | RK73FB2A101J | CHIP R 100 J 1/10W | 690S | |
| R49 | | | RK73FB2A105J | CHIP R 1.0K J 1/10W | 690S | |
| R50 | | | RK73FB2A104J | CHIP R 100K J 1/10W | 690S | |
| R51 | | | RK73FB2A473J | CHIP R 47K J 1/10W | 690S | |
| R52 | | | RK73FB2A101J | CHIP R 100 J 1/10W | 690S | |
| R53 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R54 | | | RK73FB2A392J | CHIP R 3.9K J 1/10W | | |
| R55 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R56 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R57 | | | RK73FB2A561J | CHIP R 560 J 1/10W | | |
| R58 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R59 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R60 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R61 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R62 | | | RK73FB2A331J | CHIP R 330 J 1/10W | | |
| R63 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R64 | | | RK73FB2A561J | CHIP R 560 J 1/10W | | |
| R65 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R66 ,67 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R68 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R69 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R70 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R71 | | | RK73FB2A681J | CHIP R 680 J 1/10W | | |
| R72 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R73 ,74 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R75 | | | RK73FB2A331J | CHIP R 330 J 1/10W | | |
| R76 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R77 | | | RK73FB2A682J | CHIP R 6.8K J 1/10W | | |
| R78 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R79 | | | RK73FB2A331J | CHIP R 330 J 1/10W | | |
| R80 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R81 | | | RK73FB2A273J | CHIP R 27K J 1/10W | | |
| R82 ,83 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R84 | | | RK73FB2A334J | CHIP R 330K J 1/10W | | |
| R85 | | | RK73FB2A182J | CHIP R 1.8K J 1/10W | | |
| R86 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R87 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R88 | | | RK73FB2A682J | CHIP R 6.8K J 1/10W | | |
| R89 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R90 | | | RK73FB2A331J | CHIP R 330 J 1/10W | | |
| R91 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R92 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R93 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R94 | | | RK73FB2A682J | CHIP R 6.8K J 1/10W | | |
| R95 | | | RK73FB2A684J | CHIP R 680K J 1/10W | | |
| R96 | | | RK73FB2A182J | CHIP R 1.8K J 1/10W | | |
| R97 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R98 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R99 ,100 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R101-104 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R105 | | | RK73FB2A181J | CHIP R 180 J 1/10W | 690S | |
| R106 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R107 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | 690S | |

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M:Other Areas

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

△ indicates safety critical components

PARTS LIST

* New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

PLL UNIT (X50-3150-XX)

CAR UNIT (X50-3160-00)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|---|---------------|-------------------|---|---|--------------------------------------|--------------------|
| R108,109 R110 R111 R112 R113 | | | RK73FB2A102J RK73FB2A331J RK73FB2A101J RK73FB2A331J RK73FB2A471J | CHIP R 1.0K J 1/10W CHIP R 330 J 1/10W CHIP R 100 J 1/10W CHIP R 330 J 1/10W CHIP R 470 J 1/10W | 690S 690S 690S 690S 690S | |
| R114 R115,116 R117,118 R119 W4 ,5 | | | RK73FB2A220J RK73FB2A103J R92-0679-05 RK73FB2A101J R92-1061-05 | CHIP R 22 J 1/10W CHIP R 10K J 1/10W CHIP R 0 0HM CHIP R 100 J 1/10W JUMPER REST 0 0HM | 450S | |
| D1 D2 D3 D4 D5 | | | 1SV166 RLS135 1SV166 RLS135 1SV166 | DIODE DIODE DIODE DIODE DIODE | | |
| D6 D7 D8 D9 D10 | | | RLS135 1SV166 RLS135 DAN202K 1SV166 | DIODE DIODE DIODE DIODE DIODE | 690S 690S | |
| D11 -14 IC1 ,2 IC3 IC4 IC5 ,6 | | | RLS135 UPD74HC390G SN16913P SN76514N CXD1225M | DIODE IC IC(DUBLE BALANCED MIXERS) IC(MIXER) IC(PLL SYNTHESIZER) | 690S | |
| IC7 Q1 ,2 Q3 -5 Q6 -8 Q7 | | * | TA78L08F 2SC2714(Y) 2SC2712(Y) DTC114EK DTC114EK | IC TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR | 690S | |
| Q10 -12 Q13 Q14 Q15 Q16 -18 | | | 2SK210(GR) 2SK210(GR) 2SC2714(Y) 2SC2996(Y) 2SC2714(Y) | FET FET TRANSISTOR TRANSISTOR TRANSISTOR | 690S | |
| Q19 -21 Q22 Q23 Q24 -26 Q27 | | | 2SC3324(G) DTC114TK 2SC2996(Y) 2SC3324(G) DTC114EK | TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR | 690S | |
| Q28 -30 Q31 - | | | DTA143EK 2SC2714(Y) X58-3390-03 | DIGITAL TRANSISTOR TRANSISTOR SUB UNIT(VC02) | | |
| CAR UNIT (X50-3160-00) | | | | | | |
| C1 C2 -4 C5 C6 C7 | | | CE04EW1A470M CK73FB1E103K CE04EW1A470M CK73FB1H271K CC73FCH1H390J | ELECTRO 47UF 10WV CHIP C 0.01UF K ELECTRO 47UF 10WV CHIP C 270PF K CHIP C 39PF J | | |
| C8 ,9 C10 C11 C12 C13 | | | CK73FB1E103K CK73EB1E104K CK73FB1E103K CE04EW1A470M CK73FF1E104Z | CHIP C 0.01UF K CHIP C 0.10UF K CHIP C 0.01UF K ELECTRO 47UF 10WV CHIP C 0.1UF Z | | |

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TS-690S : K,X,P,E,E2,M

△ indicates safety critical components.

TS-450S/690S

PARTS LIST

× New Parts

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Teile ohne Parts No. werden nicht geliefert.

CAR UNIT (X50-3160-00)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| C14 | | | CK73FB1H331K | CHIP C 330PF K | | |
| C15 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C16 | | | CK73FB1H331K | CHIP C 330PF K | | |
| C17 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C18 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C19 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | |
| C20 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C21 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | |
| C22 , 23 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C24 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | |
| C25 | | | CK73FB1H271K | CHIP C 270PF K | | |
| C28 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C29 | | | CK73FB1H681K | CHIP C 680PF K | | |
| C30 | | | CK73FB1H122K | CHIP C 1200PF K | | |
| C31 | | | CK73FB1H681K | CHIP C 680PF K | | |
| C32 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C33 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C34 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | |
| C35 | | | CC73FCH1H150J | CHIP C 15PF J | | |
| C36 | | | CC73FCH1H100D | CHIP C 10PF D | | |
| C37 -43 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C44 | | | CK73FB1H331K | CHIP C 330PF K | | |
| C45 | | | CC73FCH1H060D | CHIP C 6PF D | | |
| C46 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C47 | | | CC73FCH1H060D | CHIP C 6PF D | | |
| C48 | | | CK73FB1H331K | CHIP C 330PF K | | |
| C49 -50 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C51 , 52 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C53 | | | CC73FRH1H270J | CHIP C 27PF J | | |
| C54 | | | CC73FCH1H0R5C | CHIP C 0.5PF C | | |
| C55 | | | CC73FRH1H270J | CHIP C 27PF J | | |
| C56 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C57 -60 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C61 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C62 | | | CC73FCH1H220J | CHIP C 22PF J | | |
| C63 | | | CC73FCH1H0R5C | CHIP C 0.5PF C | | |
| C64 | | | CC73FCH1H050C | CHIP C 5PF C | | |
| C65 | | | CC73FCH1H0R5C | CHIP C 0.5PF C | | |
| C66 | | | CC73FCH1H220J | CHIP C 22PF J | | |
| C67 -69 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C70 , 71 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| C76 -81 | | | CC73FSL1H101J | CHIP C 100PF J | | |
| C82 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C83 | | | CC73FUJ1H100D | CHIP C 10PF D | | |
| C84 | | | CK73FB1H471K | CHIP C 470PF K | | |
| C85 | | | CC73FCH1H330J | CHIP C 33PF J | | |
| C86 , 87 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C88 | | | CC73FCH1H010C | CHIP C 1PF C | | |
| C89 | | | CC73FCH1H030C | CHIP C 3PF C | | |
| TC1 | | | C05-0030-15 | TRIM CAP 20PF | | |
| CN1 | | | E40-3239-05 | PIN CONNECTOR | | |
| CN2 | | | E04-0159-05 | RF COAXIAL CABLE RECEPTACLE | | |
| CN3 | | | E40-3237-05 | PIN CONNECTOR | | |
| CN4 | | | E04-0159-05 | RF COAXIAL CABLE RECEPTACLE | | |
| CN5 | | | E40-3239-05 | PIN CONNECTOR | | |

L:Scandinavia

K:USA

P:Canada

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

Y:PX(Far East, Hawaii)

T:England

E:Europe

Y:AAFES(Europe)

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M:Other Areas

△ indicates safety critical components

PARTS LIST

× New Parts

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Teile ohne Parts No. werden nicht geliefert.

CAR UNIT (X50-3160-00)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| CN6 | | | E40-3238-05 | PIN CONNECTOR | | |
| CN7 | | | E40-5347-05 | PIN CONNECTOR | | |
| L1 ,2 | | * | L40-4701-17 | SMALL FIXED INDUCTOR | | |
| L3 ,4 | | | L40-8201-17 | SMALL FIXED INDUCTOR | | |
| L5 | | | L40-4701-13 | SMALL FIXED INDUCTOR | | |
| L6 ,7 | | | L40-4701-17 | SMALL FIXED INDUCTOR | | |
| L8 ,9 | | | L40-2201-17 | SMALL FIXED INDUCTOR | | |
| L10 | | | L40-4701-17 | SMALL FIXED INDUCTOR | | |
| L11 | | | L40-1592-17 | SMALL FIXED INDUCTOR | | |
| L12 | | | L40-6801-17 | SMALL FIXED INDUCTOR | | |
| L13 | | | L40-1292-17 | SMALL FIXED INDUCTOR | | |
| L14 | | | L40-6801-17 | SMALL FIXED INDUCTOR | | |
| L15 | | | L40-1592-17 | SMALL FIXED INDUCTOR | | |
| L16 -18 | | | L34-4222-05 | COIL | | |
| L19 | | | L34-4003-05 | COIL | | |
| L20 | | | L34-4222-05 | COIL | | |
| L21 | | | L32-0201-05 | OSCILLATING COIL | | |
| X1 | | | L77-1302-05 | CRYSTAL RESONATOR(8.375MHZ) | | |
| CP1 -4 | | | R90-0721-05 | MULTI-COMP | | |
| R1 | | | RK73FB2A560J | CHIP R 56 J 1/10W | | |
| R2 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R3 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R4 | | | RK73FB2A184J | CHIP R 180K J 1/10W | | |
| R5 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R6 | | | RK73FB2A331J | CHIP R 330 J 1/10W | | |
| R7 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R8 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R9 | | | RK73FB2A681J | CHIP R 680 J 1/10W | | |
| R10 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R11 | | | RK73FB2A821J | CHIP R 820 J 1/10W | | |
| R12 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R13 | | | RK73FB2A331J | CHIP R 330 J 1/10W | | |
| R14 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R15 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R16 ,17 | | | R92-0670-05 | CHIP R 0 OHM | | |
| R21 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R22 ,23 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R24 | | | RK73FB2A821J | CHIP R 820 J 1/10W | | |
| R25 ,26 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R27 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R28 | | | RK73FB2A682J | CHIP R 6.8K J 1/10W | | |
| R29 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R30 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R32 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R33 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R34 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R35 | | | RK73FB2A220J | CHIP R 22 J 1/10W | | |
| R36 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R37 -42 | | | RK73FB2A221J | CHIP R 220 J 1/10W | | |
| R43 | | | RK73FB2A470J | CHIP R 47 J 1/10W | | |
| R44 | | | RK73FB2A333J | CHIP R 33K J 1/10W | | |
| R45 | | | RK73FB2A682J | CHIP R 6.8K J 1/10W | | |
| R46 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |

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M:Other Areas

TS-450S: K,X,P,E,E2,M,M2

TS-690S: K,X,P,E,E2,M

△ indicates safety critical components.

TS-450S/690S

PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

CAR UNIT (X50-3160-00)

FILTER UNIT (X51-3110-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|--|---------------|-------------------|--|--|------------------------|--------------------|
| R47 R48 R49 R50 | | | RK73FB2A470J RK73FB2A393J RK73FB2A331J RK73FB2A150J | CHIP R 47 J 1/10W CHIP R 39K J 1/10W CHIP R 330 J 1/10W CHIP R 15 J 1/10W | | |
| D1 IC1 .2 IC3 IC4 .5 Q1 -5 | | | RLS73 YM6631 TC7S04F SN16913P 2SC2712(Y) | DIODE IC(DDS) IC(2CH NAND GATE) IC(DUBLE BALANCED MIXERS) TRANSISTOR | | |
| Q6 .7 Q8 .9 | | | 2SC2714(Y) 2SC2712(Y) | TRANSISTOR TRANSISTOR | | |
| FILTER UNIT (X51-3110-XX) -00 : TS-690S (K,X,P,E,E2) -01 : TS-450S (K,X,P,E,E2) -21 : TS-690S (M) -22 : TS-450S (M,M2) | | | | | | |
| C1 -3 C4 C5 -7 C8 C9 | | | CK73FB1H103K CK73FB1H103K CK73FB1H103K CK73FB1H103K CC45CH2H030C | CHIP C 0.010UF K CHIP C 0.010UF K CHIP C 0.010UF K CHIP C 0.010UF K CERAMIC 3PF C | MM2 690S | |
| C10 C11 C12 C13 C14 | | | CK45F1H103Z CC73FSL1H101J CC73FSL1H560J CK45F1H103Z CK73FB1H103K | CERAMIC 0.010UF Z CHIP C 100PF J CHIP C 56PF J CERAMIC 0.010UF Z CHIP C 0.010UF K | 690S | |
| C15 C16 -18 C19 C20 -24 C25 | | | CK73FB1H103K CK73FB1H103K CE04EW1E470M CK73FB1H103K CE04BW1E470M | CHIP C 0.010UF K CHIP C 0.010UF K ELECTRO 47UF 25WV CHIP C 0.010UF K ELECTRO 47UF 25WV | 690S | |
| C26 -30 C31 -33 C34 C35 C101 | | | CK73FB1H103K CK73FB1H103K CC45SL2H390J CK73FB1H103K CM93D2H102J | CHIP C 0.010UF K CHIP C 0.010UF K CERAMIC 39PF J CHIP C 0.010UF K MICA 1000PF J | | |
| C102 C103 C104,105 C106 C107 | | | CC45SL2H271J CC45SL2H331J CM93D2H102J CC45SL2H181J CM93D2H222J | CERAMIC 270PF J CERAMIC 330PF J MICA 1000PF J CERAMIC 180PF J MICA 2200PF J | | |
| C108,109 C110 C111 C112-115 C116 | | | CC45SL2H181J CM93D2H102J CM93D2H561J CC45SL2H431J CC45SL2H271J | CERAMIC 180PF J MICA 1000PF J MICA 560PF J CERAMIC 430PF J CERAMIC 270PF J | | |
| C117,118 C119 C120 C121 C122 | | | CC45SL2H431J CC45SL2H181J CC45SL2H331J CC45SL2H820J CC45SL2H221J | CERAMIC 430PF J CERAMIC 180PF J CERAMIC 330PF J CERAMIC 82PF J CERAMIC 220PF J | | |
| C123 C124 C125 C126 C127 | | | CC45SL2H270J CC45SL2H121J CC45SL2H151J CC45SL2H471J CC45SL2H470J | CERAMIC 27PF J CERAMIC 120PF J CERAMIC 150PF J CERAMIC 470PF J CERAMIC 47PF J | | |
| C128 C129,130 | | | CC45SL2H331J CC45SL2H101J | CERAMIC 330PF J CERAMIC 100PF J | MM2 | |

L:Scandinavia

K:USA

P:Canada

TS-450S : K,X,P,E,E2,M,M2

TS-690S : K,X,P,E,E2,M

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FILTER UNIT (X51-3110-XX)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕 向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-----------------------------|-------------------------|--------------------|
| C132 | | | CC45SL2H471J | CERAMIC 470PF J | MM2 | |
| C133 | | | CC45SL2H560J | CERAMIC 56PF J | MM2 | |
| C134 | | | CC45SL2H221J | CERAMIC 220PF J | MM2 | |
| C135, 136 | | | CC45SL2H121J | CERAMIC 120PF J | | |
| C137 | | | CC45SL2H271J | CERAMIC 270PF J | | |
| C138 | | | CC45SL2H470J | CERAMIC 47PF J | | |
| C139 | | | CC45SL2H151J | CERAMIC 150PF J | | |
| C140 | | | CC45SL2H560J | CERAMIC 56PF J | | |
| C141 | | | CC45SL2H680J | CERAMIC 68PF J | | |
| C142 | | | CC45SL2H181J | CERAMIC 180PF J | | |
| C143 | | | CC45SL2H470J | CERAMIC 47PF J | | |
| C144 | | | CC45SL2H101J | CERAMIC 100PF J | | |
| C145 | | | CC45SL2H180J | CERAMIC 18PF J | | |
| C146 | | * | CC45SL2H430J | CERAMIC 43PF J | | |
| C147 | | | CC45SL2H151J | CERAMIC 150PF J | | |
| C148 | | | CC45SL2H120J | CERAMIC 12PF J | | |
| C149 | | * | CC45SL2H510J | CERAMIC 51PF J | | |
| C150 | | | CC45SL2H100D | CERAMIC 10PF D | 690S | |
| C153 | | | CC45SL2H390J | CERAMIC 39PF J | 690S | |
| C154 | | | CC45SL2H180J | CERAMIC 18PF J | 690S | |
| C156 | | | CC45SL2H560J | CERAMIC 56PF J | 690S | |
| C158 | | | CC45SL2H120J | CERAMIC 12PF J | 690S | |
| C159, 160 | | * | CC45SL2H510J | CERAMIC 51PF J | | |
| TC1 | | | C05-0030-15 | TRIM CAP 20PF | | |
| CN1 | | | E04-0159-05 | RF COAXIAL CABLE RECEPTACLE | 690S | |
| CN2 | | | E04-0159-05 | RF COAXIAL CABLE RECEPTACLE | | |
| CN3, 4 | | | E04-0159-05 | RF COAXIAL CABLE RECEPTACLE | | |
| CN5 | | | E40-3237-05 | PIN CONNECTOR (2P) | | |
| CN6 | | | E40-3242-05 | PIN CONNECTOR (7P) | | |
| CN7 | | | E40-3237-05 | PIN CONNECTOR (2P) | | |
| CN8 | | | E40-3239-05 | PIN CONNECTOR (4P) | | |
| CN9 | | | E40-3242-05 | PIN CONNECTOR (7P) | | |
| F1 | | * | F06-4029-05 | FUSE 4A | | |
| A1, 2 | | * | J13-0075-05 | FUSE HOLDER | | |
| L1, 2 | | | L40-1021-14 | SMALL FIXED INDUCTOR | | |
| L3 -5 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| L6 | | | L40-1011-14 | SMALL FIXED INDUCTOR | MM2 | |
| L7 -9 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| L10 | | | L40-1011-14 | SMALL FIXED INDUCTOR | 690S | |
| L11 | | | L40-1011-14 | SMALL FIXED INDUCTOR | 690S | |
| L12 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| L101 | | * | L39-1202-05 | COIL (3.3UH) | | |
| L102, 103 | | * | L39-1203-05 | COIL (4.4UH) | | |
| L104 | | * | L39-1204-05 | COIL (1.24UH) | | |
| L105 | | * | L39-1205-05 | COIL (1.54UH) | | |
| L106 | | * | L39-1206-05 | COIL (1.74UH) | | |
| L107 | | * | L39-1207-05 | COIL (0.96UH) | | |
| L108 | | * | L39-1204-05 | COIL (1.24UH) | | |
| L109 | | * | L39-1208-05 | COIL (0.68UH) | MM2 | |
| L110 | | * | L39-1207-05 | COIL (0.96UH) | MM2 | |
| L111 | | | L34-1278-05 | COIL (8.5T) | | |
| L112 | | | L34-1277-05 | COIL (9.5T) | | |
| L113 | | | L34-1281-05 | COIL (5.5T) | | |

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TS-690S : K,X,P,E,E2,M

△ indicates safety critical components.

PARTS LIST

✧ New Parts

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Teile ohne Parts No. werden nicht geliefert.

FILTER UNIT (X51-3110-XX)

| Ref. No 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|--|---------------|-------------------|---|---|------------------------|--------------------|
| L114 L115 L116 L117-119 L120 | | * | L34-1280-05 L34-1282-05 L34-1281-05 L34-1359-05 L34-1360-05 | COIL (6.5T) COIL (4.5T) COIL (5.5T) COIL (3.5T) COIL (4.5T) | 690S | |
| L121 T101-108 T109 T110 | | | L39-0480-05 L92-0107-05 L92-0108-05 L92-0107-05 | TOROIDAL COIL (DETECTOR) TOROIDAL CORE TOROIDAL CORE TOROIDAL CORE | MM2 MM2 | |
| CP1 R1 R2 -5 R6 -9 R16 -18 | | | R90-0227-05 RK73FB2A100J RK73FB2A330J RK73FB2A270J RK73FB2A472J | MULTI-COMP 4.7KX6 J 1/6W CHIP R 10 J 1/10W CHIP R 33 2 A CHIP R 27 J 1/10W CHIP R 4.7K J 1/10W | | |
| R19 R20 -23 R24 ,25 R26 ,27 R100 | | | RK73FB2A271J RK73FB2A472J RK73FB2A104J RK73FB2A104J R92-0670-05 | CHIP R 270 J 1/10W CHIP R 4.7K J 1/10W CHIP R 100K J 1/10W CHIP R 100K J 1/10W CHIP R 0 OHM | 690S | |
| R101 R102 VR1 | | * | R92-0679-05 R92-0670-05 R12-6730-05 | CHIP R 0 OHM CHIP R 0 OHM TRIMMING POT. (220) | MM2 KXPE | |
| K1 -3 K4 K5 -10 K11 K12 -14 | | | S51-1420-05 S51-1420-05 S51-1420-05 S51-1420-05 S51-1420-05 | RELAY RELAY RELAY RELAY RELAY | MM2 MM2 | |
| K15 K16 ,17 S1 | | | S51-1429-05 S51-1420-05 S31-2416-05 | RELAY RELAY (50F) SWITCH (ANT HF/50M) | 690S 690S | |
| D1 -3 D4 D5 -7 D8 D9 ,10 | | | LFB01 LFB01 LFB01 LFB01 1SS101 | DIODE DIODE DIODE DIODE DIODE | MM2 690S | |
| D11 D12 D13 D14 D15 | | | DSA301LA DSA301LA LFB01 LFB01 RLZJ5.1B | DIODE DIODE DIODE DIODE DIODE | 690S 690S | |
| D16 D17 ,18 IC1 IC2 Q1 ,2 | | | DAP202(K) RLS73 SN74LS145N MS4581P DTB143EK | DIODE DIODE IC(BCD TO DECIMAL DECODER/DRIV IC(TRANSISTOR ARRAY) DIGITAL TRANSISTOR | KXPE | |
| W1 W2 W3 ,4 W5 W7 | | * | R92-1061-05 R92-1061-05 E33-1948-05 R92-1061-05 R92-1061-05 | JUMPER REST 0 OHM JUMPER REST 0 OHM FINISHED WIRE SET(1P,4P AT300 JUMPER REST 0 OHM JUMPER REST 0 OHM | 690S | |
| W8 W33 | | | R92-1061-05 E31-1449-05 | JUMPER REST 0 OHM CONNECTING WIRE | 690S | |

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PARTS LIST

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AT UNIT (X53-3370-00)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------------------|---------------|-------------------|-------------------|-----------------------------|------------------------|--------------------|
| AT UNIT/AT-450 (X53-3370-00) | | | | | | |
| C1 | | | CM93D2H560J | MICA 56PF J | | |
| C2 -8 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C9 ,10 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C11 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C12 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | |
| C13 -19 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C20 | | | CE04EW1E101M | ELECTRO 100UF 25WV | | |
| C21 -33 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C34 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C35 | | | CK73FB1E103K | CHIP C 0.01UF K | | |
| C101-106 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| TC1 | | | C05-0031-15 | TRIM CAP 10PF | | |
| VC101, 102 | | * | C02-0024-05 | VARIABLE CAPACITOR | | |
| A5 | | * | D40-0638-05 | GEAR ASSY | | |
| - | | | E37-0192-05 | FLAT CABLE | | |
| CN1 ,2 | | | E04-0157-05 | RF COAXIAL CABLE RECEPTACLE | | |
| CN3 | | | E40-5349-05 | FLAT CABLE (16P) | | |
| CN4 | | | E40-3243-05 | PIN CONNECTOR (8P) | | |
| A1 | | * | F10-1498-02 | SHIELDING PLATE | | |
| A2 | | * | F10-1499-04 | SHIELDING PLATE | | |
| A3 | | * | F10-1500-03 | SHIELDING PLATE | | |
| A4 | | * | F10-2001-03 | SHIELDING PLATE | | |
| - | | | G02-0717-04 | SPRING | | |
| L1 | | | L39-0496-05 | COIL | | |
| L2 | | * | L39-0415-25 | COIL | | |
| L3 -8 | | | L40-1011-13 | SMALL FIXED INDUCTOR | | |
| L9 -11 | | | L40-1011-17 | SMALL FIXED INDUCTOR | | |
| L12 -15 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| L101-106 | | | L40-1011-14 | SMALL FIXED INDUCTOR | | |
| L107 | | * | L34-1365-05 | COIL | | |
| L108 | | | L34-3145-15 | AT COIL B | | |
| L109 | | | L34-3144-15 | AT COIL A | | |
| T101, 102 | | | L92-0119-05 | TOROIDAL CORE | | |
| - | | | N87-3006-46 | BRAZIER HEAD TAPTITE SCREW | | |
| - | | | N88-3006-46 | FLAT HEAD TAPTITE SCREW | | |
| R1 ,2 | | | RD14CB2E101J | RD 100 J 1/4W | | |
| R3 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R4 | | | RD14CB2E470J | RD 47 J 1/4W | | |
| R5 ,6 | | | RK73FB2A101J | CHIP R 180 J 1/10W | | |
| R7 -10 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R11 | | | RK73FB2A563J | CHIP R 56K J 1/10W | | |
| R12 | | | RK73FB2A121J | CHIP R 120 J 1/10W | | |
| R13 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R14 | | | RK73FB2A563J | CHIP R 56K J 1/10W | | |
| R15 | | | RK73FB2A121J | CHIP R 120 J 1/10W | | |
| R16 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| R17 | | | RK73FB2A330J | CHIP R 33 J 1/10W | | |
| R18 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R19 | | | RK73FB2A330J | CHIP R 33 J 1/10W | | |
| R20 -23 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |

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AT UNIT (X53-3370-00)

VCO2 (X58-3390-03)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|--|---------------|-------------------|--|---|------------------------|--------------------|
| R24 ,25 R26 R27 -32 R33 R34 -42 VR101,102 K1 K101-106 M1 ,2 D1 ,2 D3 -8 D9 D101-106 IC1 IC2 ,3 IC4 ,5 IC6 Q1 ,2 Q3 Q4 Q5 Q6 W1 W2 W5 -19 W101 W102 W103-106 | | | RD14BB2E100J RK73FB2A472J RK73FB2A103J RK73FB2A472J R92-0670-05 R01-3435-05 S51-2417-05 S76-0401-05 T42-0453-05 1N60 1SS226 LFB01 LFB01 SN74S74NS TC4066BF BA6109U2 NJM2903M 2SC2714(Y) DTC114EK 2SA1204(Y) DTC114EK DTD143EK E37-0191-05 E31-6038-05 DD1-0005-05 E31-6038-05 E31-6083-05 E33-1949-05 | RD 10 J 1/4W CHIP R 4.7K J 1/10W CHIP R 10K J 1/10W CHIP R 4.7K J 1/10W CHIP R 0 OHM TRIM POT. 10K RELAY RELAY MOTOR DIODE DIODE DIODE DIODE IC IC(BILATERAL SWITCH X4) IC(MOTOR DRIVER) IC(COMPARATOR X2) TRANSISTOR DIGITAL TRANSISTOR TRANSISTOR DIGITAL TRANSISTOR DIGITAL TRANSISTOR CONNECTING WIRE CONNECTING WIRE COATING WIRE CONNECTING WIRE CONNECTING WIRE FINISHED WIRE SET | | |
| VCO2 (X58-3390-03) | | | | | | |
| - C1 C2 C3 C4 C5 C6 C7 C8 ,9 C10 C11 TC1 TP1 -3 - L1 L2 - R1 R2 | | | B42-2437-04 CK73FB1H102K CC73FSL1H101J CC73FCH1H070D CC73FCH1H220J CC73FCH1H070D CC73FCH1H180J CC73FCH1H120J CK73FB1H102K CC73FCH1H010CMU CK73FB1H102K C05-0331-05 E23-0603-05 G13-0904-04 L33-0690-05 L34-2353-05 N30-2604-41 RK73FB2A682J RK73FB2A271J | LABEL CHIP C 1000PF K CHIP C 100PF J CHIP C 7PF D CHIP C 22PF J CHIP C 7PF D CHIP C 18PF J CHIP C 12PF J CHIP C 1000PF K CHIP C 1.0PF C CHIP C 1000PF K TRIMMING CAP TERMINAL CUCHION CHOKE COIL 3.3UH COIL PAN HEAD MACHINE SCREW CHIP R 6.8K J 1/10W CHIP R 270 J 1/10W | | |

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VCO2 (X58-3390-03)

SIDE TONE (X59-1060-00)

VOX (X59-1080-00)

FM MIC (X59-3000-03)

NOTCH (X59-3030-00)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------------------------|---------------|-------------------|--|---|------------------------|--------------------|
| R3 R4 ,5 R6 R7 | | | RK73FB2A331J RK73FB2A472J RK73FB2A471J RK73FB2A560J | CHIP R 330 J 1/10W CHIP R 4.7K J 1/10W CHIP R 470 J 1/10W CHIP R 56 J 1/10W | | |
| D1 Q1 Q2 | | | 1SV164 2SK508NV(K52) 2SC2714(Y) | DIODE FET TRANSISTOR | | |
| SIDE TONE (X59-1060-00) | | | | | | |
| C2 C3 -6 C7 ,8 | | | CK73FB1E473K CK73FB1H123K CK73FB1E473K | CHIP C 0.047UF K CHIP C 0.012UF K CHIP C 0.047UF K | | |
| R1 ,2 R3 R4 R5 R6 | | | RK73FB2A823J RK73FB2A223J RK73FB2A472J RK73FB2A102J RK73FB2A103J | CHIP R 82K J 1/10W CHIP R 22K J 1/10W CHIP R 4.7K J 1/10W CHIP R 1.0K J 1/10W CHIP R 10K J 1/10W | | |
| R7 ,8 R9 R10 R11 W1 -6 | | | RK73FB2A333J RK73FB2A103J RK73FB2A333J RK73FB2A183J R92-0670-05 | CHIP R 33K J 1/10W CHIP R 10K J 1/10W CHIP R 33K J 1/10W CHIP R 18K J 1/10W CHIP R 0 OHM | | |
| D1 D2 D3 Q1 | | | DAN202(K) DAP202(K) DAN202(K) 2SC2712(Y) | DIODE DIODE DIODE TRANSISTOR | | |
| VOX (X59-1080-00) | | | | | | |
| C1 C2 | | | CK73FB1H102K CK73FB1E223K | CHIP C 1000PF K CHIP C 0.022UF K | | |
| R1 R2 R3 R4 ,5 R6 ,7 | | | RK73FB2A104J RK73FB2A103J RK73FB2A472J RK73FB2A103J RK73FB2A105J | CHIP R 100K J 1/10W CHIP R 10K J 1/10W CHIP R 4.7K J 1/10W CHIP R 10K J 1/10W CHIP R 1.0M J 1/10W | | |
| R8 R9 R10 W1 -3 | | | RK73FB2A104J RK73FB2A105J RK73FB2A103J R92-0670-05 | CHIP R 100K J 1/10W CHIP R 1.0M J 1/10W CHIP R 10K J 1/10W CHIP R 0 OHM | | |
| D1 -2 IC1 IC2 Q1 | | | DAP202(K) NJM2904M TC4001BF 2SC2712(Y) | DIODE IC(OP AMP X2)) IC(NOR X6) TRANSISTOR | | |
| FM MIC (X59-3000-03) | | | | | | |
| C1 C2 C3 C4 | | | CC73FCH1H680J CK73FB1H561K CC73FCH1H390J CK73FB1H102K | CHIP C 68PF J CHIP C 560PF K CHIP C 39PF J CHIP C 1000PF K | | |
| JR1 R1 -9 | | | R92-0670-05 RK73FB2AXXXJ | CHIP R 0 OHM CHIP R | | |
| IC1 Q1 | | | NJM4558M 2SC2712(Y) | IC(OP AMP X2)) TRANSISTOR | | |
| NOTCH (X59-3030-00) | | | | | | |
| C1 ,2 | | | CK73FB1H682K | CHIP C 6800PF K | | |

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NOTCH (X59-3030-00)

NB (X59-3350-00)

FAN (X59-3370-00)

TRX (X59-3680-01)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|-------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| C3 | | | CK73FB1H271K | CHIP C 270PF K | | |
| R1 -4 | | | RK73FB2A913J | CHIP R 91K J 1/10W | | |
| R5 | | | RK73FB2A681J | CHIP R 680 J 1/10W | | |
| R6 | | | RK73FB2A913J | CHIP R 91K J 1/10W | | |
| R7 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R8 | | | RK73FB2A913J | CHIP R 91K J 1/10W | | |
| R9 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R10 ,11 | | | RK73FB2A913J | CHIP R 91K J 1/10W | | |
| R12 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R13 | | | RK73FB2A684J | CHIP R 680K J 1/10W | | |
| W1 | | | R92-0670-05 | CHIP R 0 OHM | | |
| IC1 | | | NJM4558M | IC(OP AMP X2)) | | |
| NB (X59-3350-00) | | | | | | |
| C1 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| C2 | | | CK73FB1H102K | CHIP C 1000PF K | | |
| C3 | | | CK73EF1E474Z | CHIP C 0.47UF Z | | |
| R1 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R2 | | | RK73FB2A563J | CHIP R 56K J 1/10W | | |
| R3 | | | RK73FB2A684J | CHIP R 680K J 1/10W | | |
| R4 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R5 | | | RK73FB2A184J | CHIP R 180K J 1/10W | | |
| W1 -3 | | | R92-0670-05 | CHIP R 0 OHM | | |
| IC1 | | | TC4011BF | IC(NAND X4) | | |
| Q1 ,2 | | | DTC114EK | DIGITAL TRANSISTOR | | |
| FAN (X59-3370-00) | | | | | | |
| C1 | | | CK73FB1H103K | CHIP C 0.010UF K | | |
| R1 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R2 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R3 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R4 | | | RK73FB2A681J | CHIP R 680 J 1/10W | | |
| R5 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R6 | | | RK73FB2A332J | CHIP R 3.3K J 1/10W | | |
| R7 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| R8 | | | RK73FB2A223J | CHIP R 22K J 1/10W | | |
| R9 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R10 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| W1 ,2 | | | R92-0670-05 | CHIP R 0 OHM | | |
| IC1 | | | NJM2904M | IC(OP AMP X2)) | | |
| Q1 | | | 2SC2712(Y) | TRANSISTOR | | |
| TRX (X59-3680-01) | | | | | | |
| R151 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R152 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R153 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R154 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R155 | | | RK73FB2A471J | CHIP R 470 J 1/10W | | |
| R156 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| Q151,152 | | | 2SA1213(Y) | TRANSISTOR | | |
| Q153-155 | | | DTC114TK | DIGITAL TRANSISTOR | | |

L:Scandinavia

K:USA

P:Canada

TS-450S : K,X,P,E,E2,M,M2

Y:PX(Far East, Hawaii)

T:England

E:Europe

TS-690S : K,X,P,E,E2,M

Y:AAFES(Europe)

X:Australia

M:Other Areas

△ indicates safety critical components

PARTS LIST

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

DELAY (X59-3860-00)

SELECT (X59-3920-00)

BK-IN (X59-3930-00)

METER (X59-3940-00)

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|-----------------------------|---------------|-------------------|-------------------|----------------------------|------------------------|--------------------|
| DELAY (X59-3860-00) | | | | | | |
| C1 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| R1 | | | RK73FB2A472J | CHIP R 4.7K J 1/10W | | |
| R2 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R3 | | | RK73FB2A101J | CHIP R 100 J 1/10W | | |
| D1 ,2 | | | RLS73 | DIODE | | |
| D3 | | | DAN202K | DIODE | | |
| IC1 | | | TC4538BF | IC(ONE SHOT MULT) | | |
| SELECT (X59-3920-00) | | | | | | |
| C1 -3 | | | CK73FF1C105Z | CHIP C 1.0UF Z | | |
| R1 ,2 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R3 | | | RK73FB2A562J | CHIP R 5.6K J 1/10W | | |
| IC1 | | | TC4053BF | IC(3-INPUT 2CH MPX/DE-MPX) | | |
| BK-IN (X59-3930-00) | | | | | | |
| C1 | | | CK73FB1E393K | CHIP C 0.039UF K | | |
| C2 | | * | CK73FB1E683K | CHIP C 0.068UF K | | |
| C3 | | | CK73FB1E683K | CHIP C 0.068UF K | | |
| R1 | | | RK73FB2A154J | CHIP R 150K J 1/10W | | |
| R2 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R3 | | | RK73FB2A474J | CHIP R 470K J 1/10W | | |
| R4 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R5 -7 | | | R92-0670-05 | CHIP R 0 OHM | | |
| D1 ,2 | | | RLS73 | DIODE | | |
| D3 | | | DAN202(K) | DIODE | | |
| IC1 | | | TC4069UBF | IC(INVERTER X6) | | |
| IC2 ,3 | | | TC4511F | IC(2 INPUT NAND GATE) | | |
| Q1 | | | DTC124EK | DIGITAL TRANSISTOR | | |
| METER (X59-3940-00) | | | | | | |
| C1 ,2 | | | CK73FF1E104Z | CHIP C 0.1UF Z | | |
| R1 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R2 | | | RK73FB2A684J | CHIP R 680K J 1/10W | | |
| R3 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R4 ,5 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R6 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R7 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R8 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R9 | | | RK73FB2A684J | CHIP R 680K J 1/10W | | |
| R10 | | | RK73FB2A104J | CHIP R 100K J 1/10W | | |
| R11 | | | RK73FB2A224J | CHIP R 220K J 1/10W | | |
| R12 | | | RK73FB2A102J | CHIP R 1.0K J 1/10W | | |
| R13 ,14 | | | R92-0670-05 | CHIP R 0 OHM | | |
| D1 ,2 | | | HSM88AS | DIODE | | |
| IC1 | | | NJM2904M | IC(OP AMP X2) | | |

L:Scandinavia

K:USA

P:Canada

TS-450S : K,X,P,E,E2,M,M2

Y:PX(Far East, Hawaii)

T:England

E:Europe

TS-690S : K,X,P,E,E2,M

Y:AAFES(Europe)

X:Australia

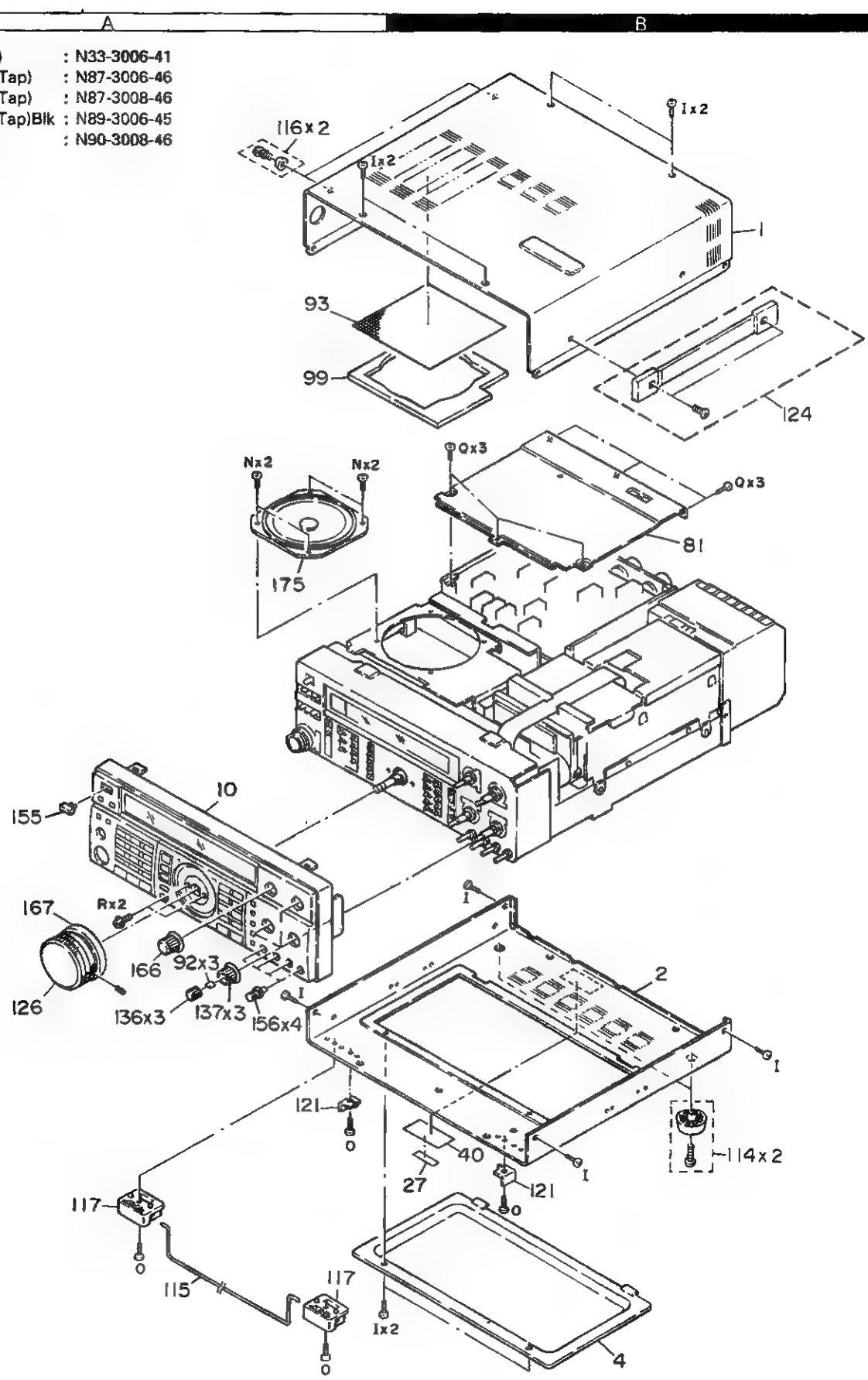
M:Other Areas

⚠ indicates safety critical components.

TS-450S/690S

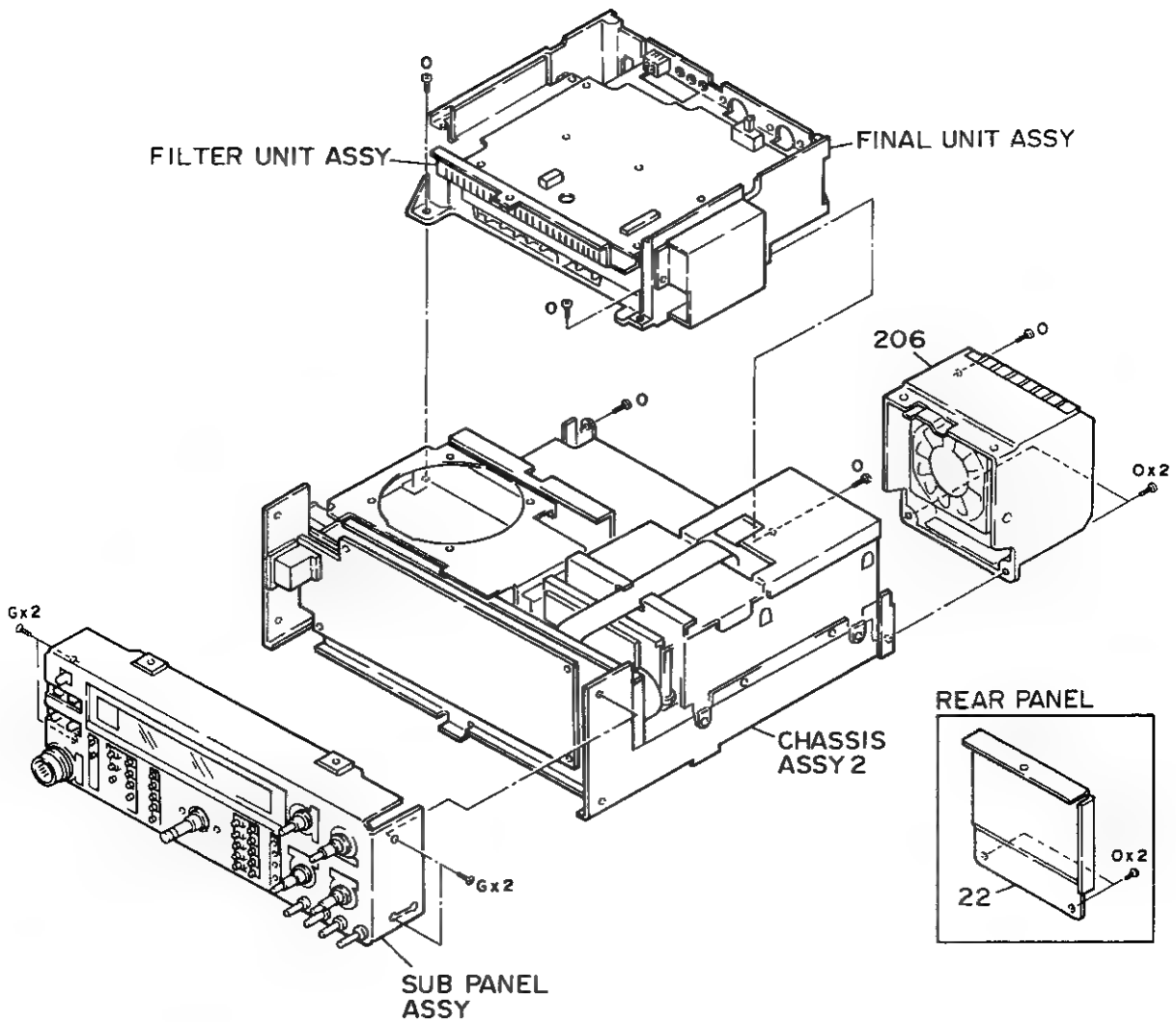
EXPLODED VIEW

- | | | |
|---|--------------------|---------------|
| I | M3 x 6 (OC) | : N33-3006-41 |
| N | M3 x 6 (Br-Tap) | : N87-3006-46 |
| O | M3 x 8 (Br-Tap) | : N87-3008-46 |
| Q | M3 x 6 (Bl-Tap)Blk | : N89-3006-45 |
| R | M3 x 8 (TP) | : N90-3008-46 |



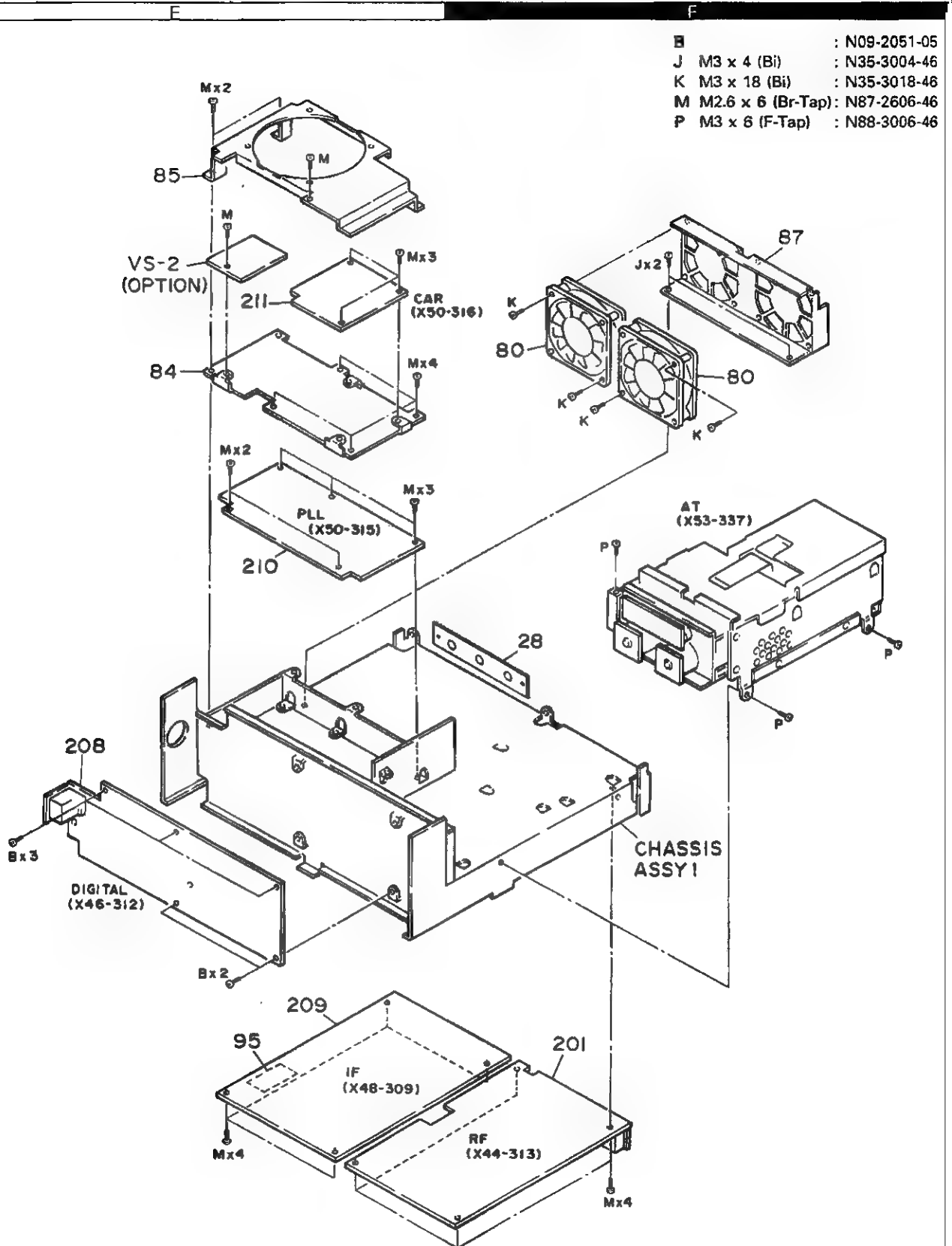
EXPLODED VIEW

G M3 x 5 (F) : N32-3005-46
O M3 x 8 (Br-Tap) : N87-3008-46

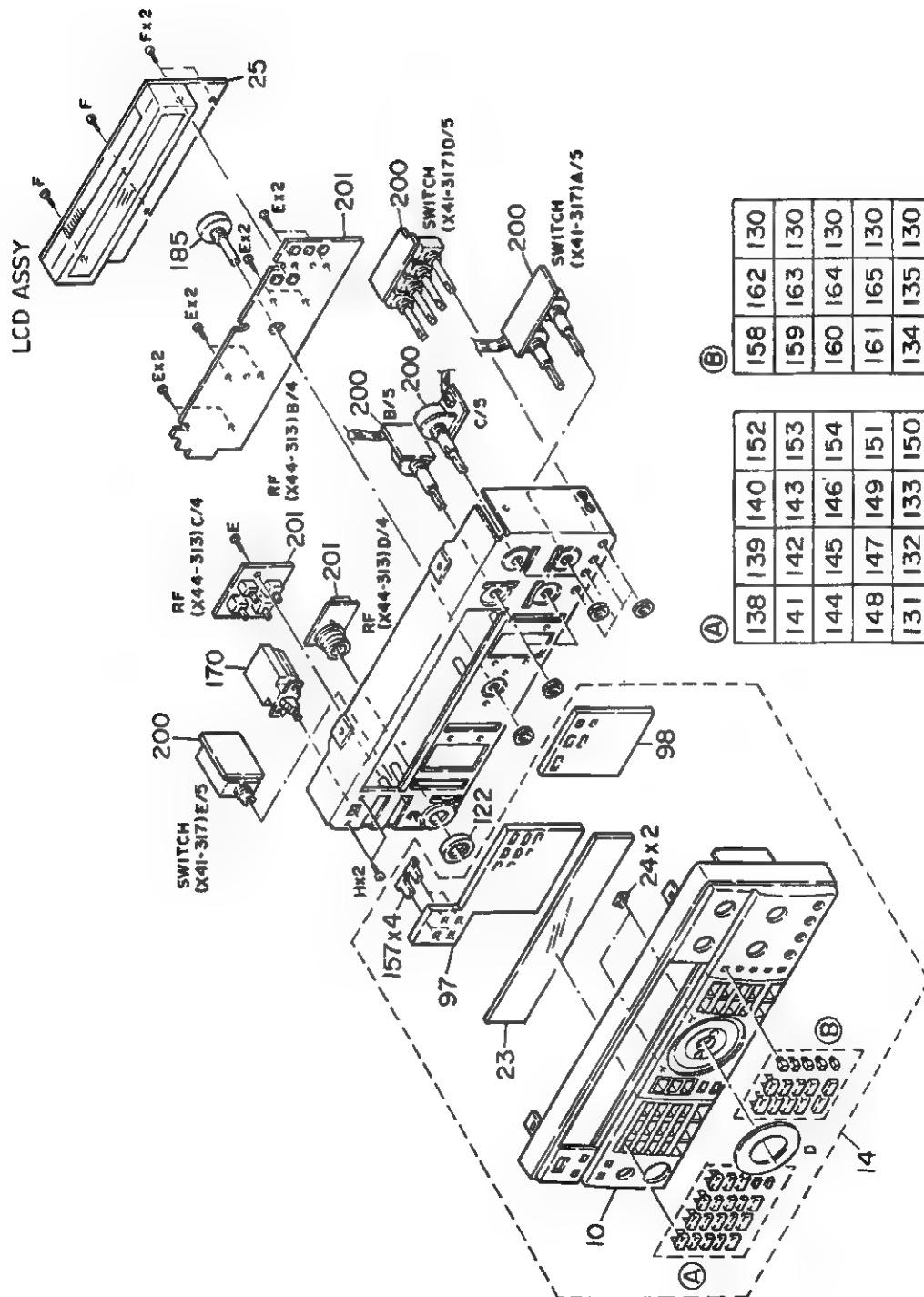


TS-450S/690S

EXPLODED VIEW



EXPLODED VIEW

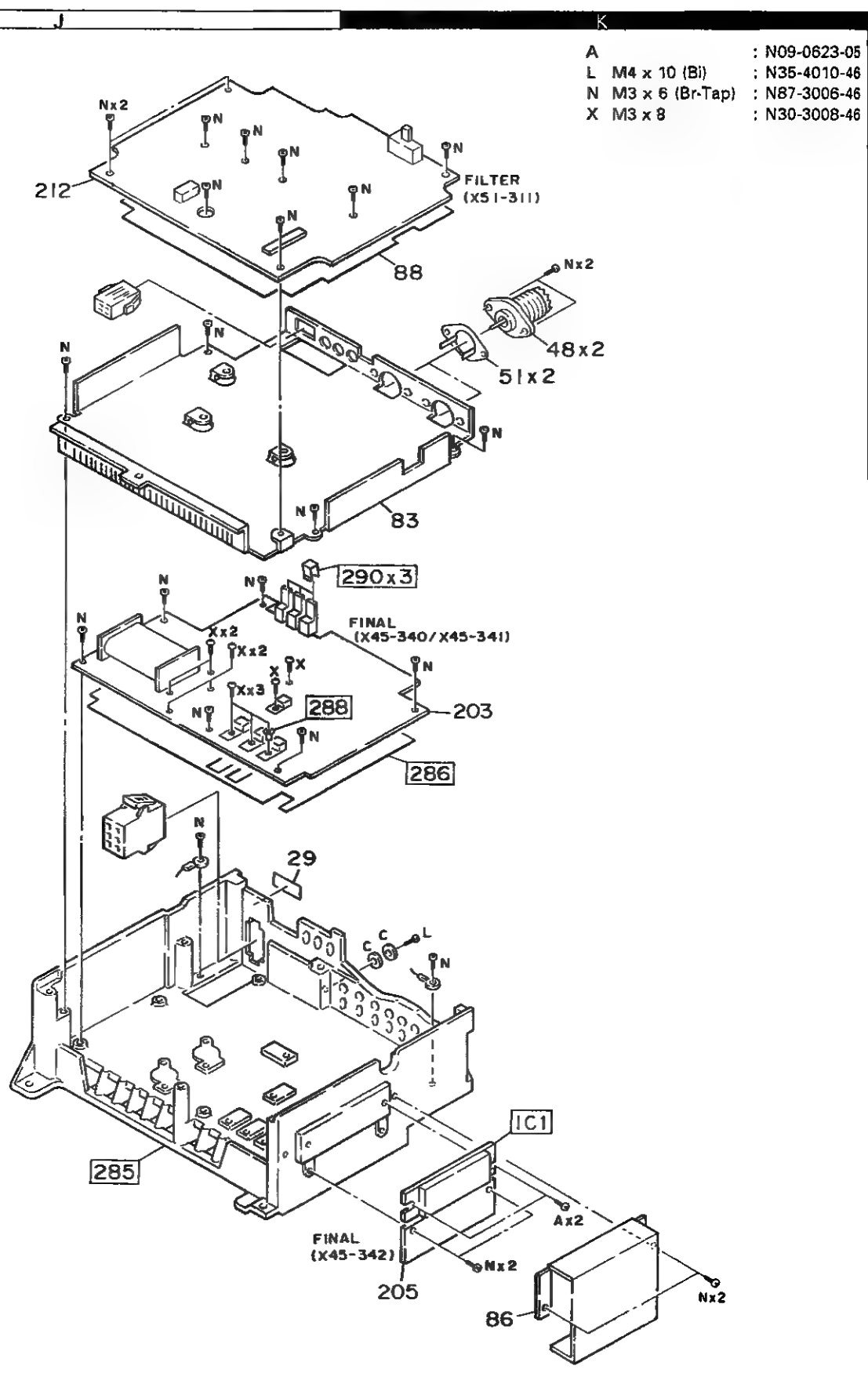


E M2.6 x 4 (F) : N32-2604-46
 F M2.6 x 6 (F) : N32-2605-46
 H M3 x 16 (F) : N32-3016-46

| | | | | |
|-----|-----|-----|-----|-----|
| (A) | 138 | 139 | 140 | 152 |
| | 141 | 142 | 143 | 153 |
| | 144 | 145 | 146 | 154 |
| | 148 | 147 | 149 | 151 |
| (B) | 158 | 162 | 130 | |
| | 159 | 163 | 130 | |
| | 160 | 164 | 130 | |
| | 161 | 165 | 130 | |
| (C) | 134 | 135 | 130 | |
| | | | | |
| | | | | |
| | | | | |

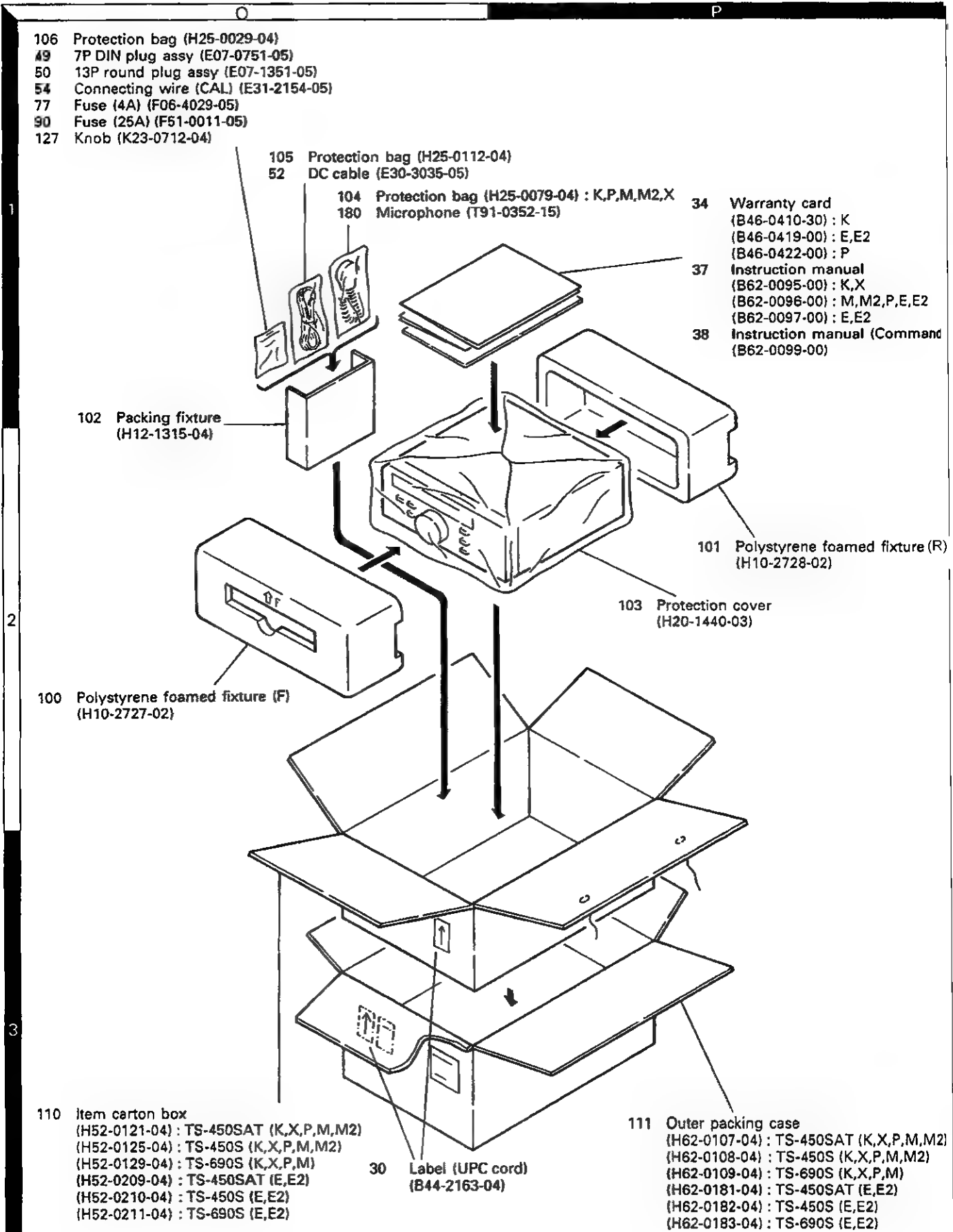
TS-450S/690S

EXPLODED VIEW



TS-450S/690S

PACKING



ADJUSTMENT

Required Test Equipment

1. DC Voltmeter (DC V.M)

- 1) Input resistance : More than $1M\Omega$
- 2) Voltage range : 1.5 to 1000V AC/DC

Note : A high-precision multimeter maybe used. However, accurate readings can not be obtained for high-impedance circuits.

2. AC Ammeter

- 1) Current range : 1.5A, 3A, 20A, High-precision ammeter may be used.

3. RF VTVM (RF V.M)

- 1) Input impedance : $1M\Omega$ and less than 3pF, min.
- 2) Voltage range : 10mV to 300V
- 3) Frequency range : 10kHz to 100MHz or greater.

4. AF Voltmeter (AF V.M)

- 1) Frequency range : 50Hz to 10kHz
- 2) Input resistance : $1M\Omega$ or greater
- 3) Voltage range : 10mV to 30V

5. AF Generator (AG)

- 1) Frequency range : 200Hz to 5kHz
- 2) Output : 1mV or less to 1V, low distortion

6. AF Dummy Load

- 1) Impedance : 8Ω
- 2) Dissipation : 3W or greater

7. Oscilloscope (SCOPE)

Vertical amplifier which has frequency characteristics higher than 100MHz.
Requires high sensitivity, and external synchronization capability.

8. Tracking Generator

- 1) Center frequency : 50kHz to 90MHz
- 2) Frequency deviation : Maximum ± 35 MHz
- 3) Output voltage : 0.1V or greater
- 4) Sweep rate : At least 0.5sec/cm

9. Standard Signal Generator (SSG)

- 1) Frequency range : 50kHz to 500MHz
 - 2) Output : -20 dB/0.1 μ V to 120dB/1V
 - 3) Output impedance : 50Ω
 - 4) AM and FM modulation can be possible
- Note** : Generator must be frequency stable.

10. Frequency Counter (f. counter)

- 1) Minimum input voltage : 50mV
- 2) Frequency range : 500MHz or greater
- 3) Output impedance : 50Ω

11. Noise Generator

Must generate ignition noise containing harmonics beyond 30MHz.

12. RF Dummy Load

- 1) Impedance : 150Ω
- 2) Dissipation : 150W or greater

13. Power Meter

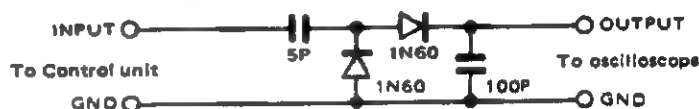
- 1) Impedance : 50Ω
- 2) Dissipation : 150W continuous or greater
- 3) Frequency limits : 60MHz or greater

14. Spectrum Analyzer

- 1) Frequency range : 100kHz to 500MHz or greater
- 2) Bandwidth : 1kHz to 3MHz

15. Detector

- 1) For adjustment of PLL/VCO BPF



16. Directional Coupler

17. Power Supply

PS-33, PS-53

18. Microphone

MC-43S or MC60 (S8)

Preference

| Japanese "SG" | American "SG" |
|---------------|---------------|
| -6dB | 0.25 μ V |
| 0dB | 0.5 μ V |
| 6dB | 1 μ V |
| 12dB | 2 μ V |
| 24dB | 8 μ V |
| 30dB | 15.8 μ V |
| 40dB | 50 μ V |
| 50dB | 158 μ V |
| 60dB | 500 μ V |
| 70dB | 1.58mV |
| 80dB | 5mV |
| 90dB | 15.8mV |
| 100dB | 50mV |
| 120dB | 0.5V |

ADJUSTMENT

Operations

1. Setting of adjustment mode

- 1) Power ON while pressing the AIP, XIT, SCAN keys.
(MENU No. changes when turn knob of M. CH/
VFO CH.)
- 2) Push the UP key by MENU No. 2, write can be
made for adjustment frequency to the memory
channel.
- 3) Memory channel is displayed by MENU No. 3.
Memory can be changed by UP, DOWN keys.
- 4) MENU No. 3~13 can be used in adjust mode.
- 5) In the adjust mode, ordinary memory channel is dis-
played by pressing CLR key.
Channel can be changed by the VR of M.CH/
VFO CH.

01 FdIE

↑ MENU No.

02

03 ch00

↑ Memory channel

00 14.000.00

↑ Memory channel

32 on

2. Setting of expansion menu mode

- 1) Power ON while pressing the M. IN key.
(Power down 10W used only for adjustment)

3. Others

- 1) ANT between measuring terminals can be used on
the side of HF-50M unless otherwise specified.

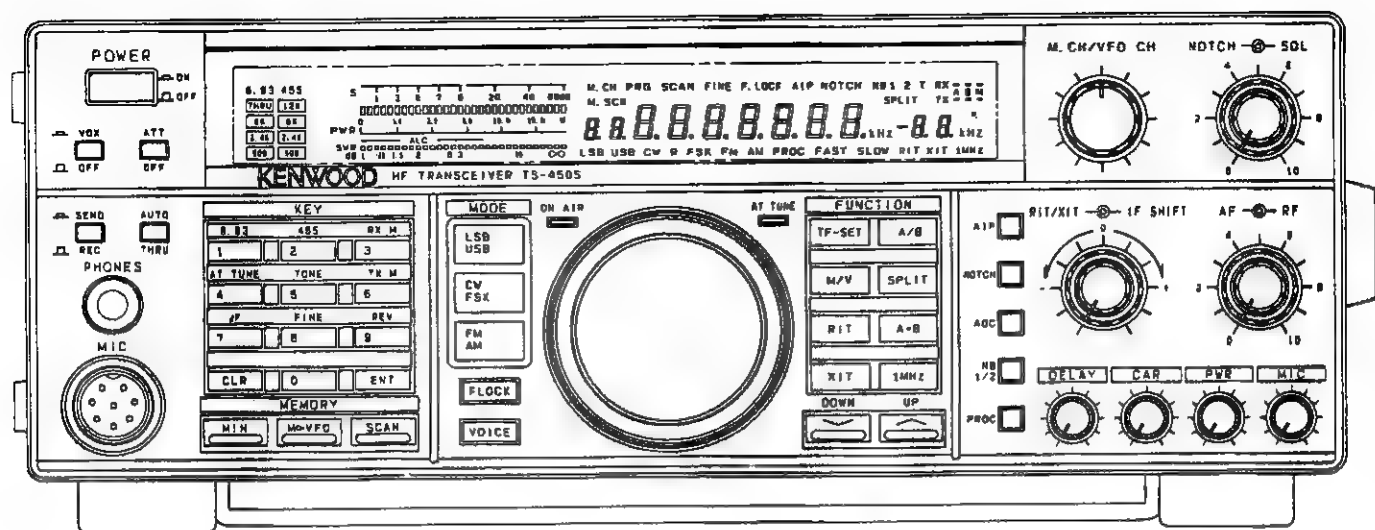
Frequency Table for Adjustment

| Item | CH | Frequency | Mode | MENU No. | AGC | AIP |
|----------|----|-----------|------|----------|------|-----|
| RFG | 00 | 14.100.00 | USB | 03 | FAST | OFF |
| RIT | 00 | 14.100.00 | USB | 04 | FAST | OFF |
| IF SHIFT | 00 | 14.100.00 | USB | 05 | FAST | OFF |
| MCF | 00 | 14.100.00 | USB | | FAST | OFF |
| LO2 | 00 | 14.100.00 | USB | | FAST | OFF |
| IF AMP | 00 | 14.100.00 | USB | 06 | FAST | OFF |
| OPT FIL | 01 | 14.099.50 | USB | 07 | FAST | OFF |
| 8.83 MCF | 02 | 14.100.00 | USB | | FAST | OFF |
| IF trap | 02 | 14.100.00 | USB | | FAST | OFF |
| MIX BAL | 03 | 0.100.00 | USB | | FAST | OFF |
| RF AMP | 04 | 24.800.00 | USB | | FAST | OFF |
| RF AMP | 05 | 53.800.00 | USB | | FAST | OFF |
| FM AMP | 06 | 28.800.00 | FM | | - | OFF |
| S-meter | 06 | 28.800.00 | FM | | - | OFF |
| S-meter | 07 | 14.100.00 | USB | 08 | FAST | OFF |
| S-meter | 08 | 28.800.00 | USB | 09 | FAST | OFF |
| S-meter | 09 | 50.100.00 | USB | 10 | FAST | OFF |
| BEEP | 10 | 14.100.00 | USB | | FAST | OFF |
| NOTCH | 10 | 14.100.00 | USB | | FAST | OFF |
| NB | 10 | 14.100.00 | USB | | FAST | OFF |
| RF ATT | 10 | 14.100.00 | USB | | FAST | OFF |
| RF GAIN | 10 | 14.100.00 | USB | | FAST | OFF |
| AGC | 10 | 14.100.00 | USB | | F/S | OFF |
| VOICE | 10 | 14.100.00 | USB | | FAST | OFF |
| S/N | 11 | 0.550.00 | AM | | FAST | OFF |
| S/N | 12 | 1.550.00 | AM | | FAST | OFF |
| S/N | 13 | 1.800.00 | LSB | | FAST | OFF |
| S/N | 14 | 3.550.00 | LSB | | FAST | OFF |
| S/N | 15 | 7.100.00 | LSB | | FAST | OFF |
| S/N | 16 | 10.100.00 | USB | | FAST | OFF |
| S/N | 17 | 14.100.00 | USB | | FAST | OFF |
| S/N | 18 | 21.100.00 | USB | | FAST | OFF |
| S/N | 19 | 24.800.00 | USB | | FAST | OFF |
| S/N | 20 | 28.800.00 | USB | | FAST | OFF |

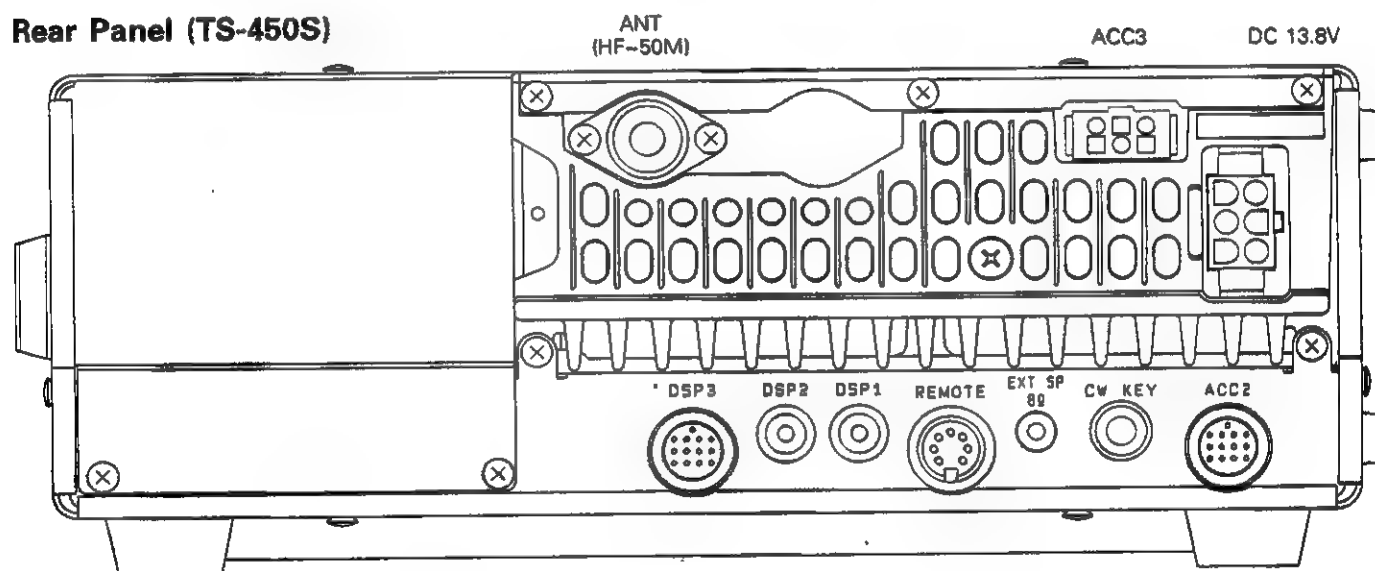
| Item | CH | Frequency | Mode | MENU No. | AGC | AIP |
|-------------|----|-----------|------|----------|------|-----|
| S/N | 21 | 29.800.00 | FM | | - | OFF |
| S/N | 22 | 51.100.00 | FM | | - | OFF |
| S/N | 23 | 50.100.00 | USB | | FAST | OFF |
| S/N | 24 | 53.800.00 | USB | | FAST | OFF |
| SQL | 25 | 14.100.00 | USB | | FAST | OFF |
| SQL | 26 | 28.800.00 | FM | | - | OFF |
| ALC voltage | 27 | 29.600.00 | CW | | FAST | OFF |
| TX AMP | 27 | 29.600.00 | CW | | FAST | OFF |
| MIX BIA | 27 | 29.600.00 | CW | | FAST | OFF |
| MIX BIA | 28 | 53.500.00 | CW | | FAST | OFF |
| 50M AMP | 29 | 51.900.00 | CW | | FAST | OFF |
| NULL | 30 | 3.500.00 | CW | | FAST | OFF |
| ALC | 31 | 14.200.00 | CW | | FAST | OFF |
| 100, 50W | 32 | 24.900.00 | CW | | FAST | OFF |
| 100, 50W | 33 | 29.600.00 | CW | | FAST | OFF |
| 100, 50W | 34 | 53.500.00 | CW | | FAST | OFF |
| 10W | 35 | 51.900.00 | CW | | FAST | OFF |
| 10W | 36 | 14.200.00 | CW | | FAST | OFF |
| 10W | 37 | 1.840.00 | CW | | FAST | OFF |
| MIN PWR | 38 | 14.200.00 | CW | | FAST | OFF |
| CAR point | 39 | 14.200.00 | USB | 11 | FAST | OFF |
| CAR point | 39 | 14.200.00 | USB | 12 | FAST | OFF |
| ALC meter | 39 | 14.200.00 | USB | 13 | FAST | OFF |
| CAR sup. | 39 | 14.200.00 | USB | | FAST | OFF |
| Spurious | 40 | 53.900.00 | CW | | FAST | OFF |
| Spurious | 41 | 21.200.00 | CW | | FAST | OFF |
| SWR | 42 | 14.200.00 | CW | | FAST | OFF |
| SWR Meter | 43 | 1.840.00 | CW | | FAST | OFF |
| FM DEV | 44 | 28.700.00 | FM | | - | OFF |
| FM MIC | 44 | 28.700.00 | FM | | - | OFF |
| Processor | 45 | 14.200.00 | USB | | FAST | OFF |
| Side tone | 45 | 14.200.00 | CW | | FAST | OFF |
| Fan motor | 46 | 51.900.00 | CW | | FAST | OFF |

ADJUSTMENT

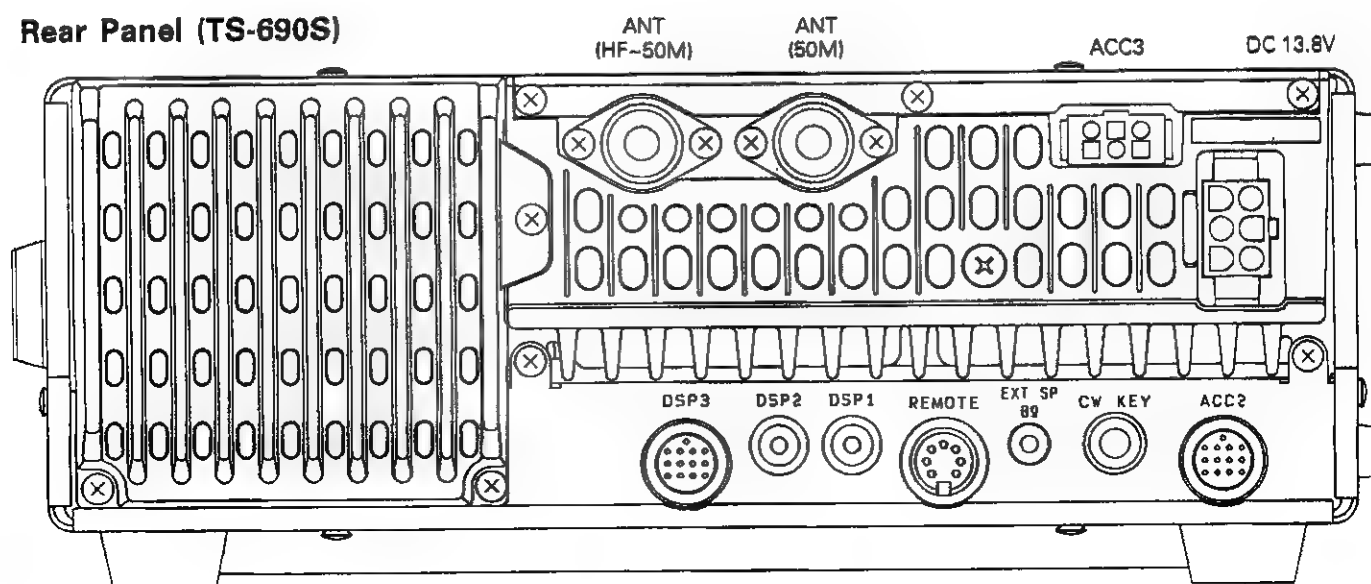
Front Panel (TS-450S)



Rear Panel (TS-450S)



Rear Panel (TS-690S)



TS-450S/690S

ADJUSTMENT

Initialize Setting and Display Check

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|----------------------------|---|----------------|------|----------|------------|-------|--|---|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 1. Setting | | | | | IF | VR13 | Set to mechanical centered point. | Not to break the core. *S1 → OFF |
| | | | | | | L5 | Put the core into the deepest mechanically. | |
| | | | | | | *S1 | | |
| 2. Display check and reset | 1) DC IN : 13.8V Connect the DC plug FILTER S1 : HF (TS-690S) POWER : ON After checked POWER : OFF Pushing A=B, POWER : ON | Display | | | | | Reset display Display f. : 14.000.00 MODE : USB FUNCTION RX : A FUNCTION TX : A METER : ALC FILTER 8.83 : 6kHz FILTER 455 : 2.4kHz AGC : SLOW | Must display correctly. Must be no generation of smoke or abnormal noise. Should be at the reset frequency. |

PLL and CAR Adjustment

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|-----------------------|---|-------------------------------------|------|------------------|---|-----------------------------|---|------------------------|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 1. Reference OSC | | f. counter | CAR | TP1 (20M) | PLL | TC1 | 20.000.000MHz | ±20Hz |
| 2. LO3 8.375MHz | | Oscilloscope (100MHz) f. counter | | CN3-1 | CAR | L21 | 1.00Vp-p Make adjustment in the drawing direction of core. | ±0.05Vp-p |
| | | | | | | TC1 | 8.375MHz | ±10Hz |
| 3. 60MHz BPF | | Oscilloscope (100MHz or more) | | IC5-5 | | L16 L17 | MAX. (0.7Vp-p) | |
| 4. DLO | 1) Frequency : 14.200MHz | | CN4 | | L18~ L20 | MAX. (0.2Vp-p/50Ω) | | |
| 5. PLL IF BPF TS-690S | 1) Frequency : 50.200MHz | Oscilloscope | PLL | TP5 | PLL | L31 L32 | MAX. (0.1Vp-p) | |
| 6 VCO | 1) Frequency : 0.03MHz : 10.490MHz | DC V.M | | TP2 | L5 | 2.5V 7.0V or less check. | | |
| | 2) Frequency : 10.500MHz : 21.490MHz | | | | L7 | 2.5V 7.0V or less check. | | |
| | 3) Frequency : 21.500MHz : 40.490MHz | | | | L9 | 2.5V 7.0V or less check. | | |
| | TS-690S | | | | 4) Frequency : 60.000MHz : 40.500MHz | L11 | 6.9V 2.5V or more check. | |
| 7. VCO2 | | | TP3 | VCO2 X58-3390 | TC1 | 5.0V | | |

Adjustment Mode setting


| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|-----------------|--|----------------|------|----------|-------------|--------------|--|----------------------------------|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 1. Memory write | 1) POWER : OFF Pushing AIP, XIT and SCAN, POWER : ON | | | | Front panel | M.CH /VFO | Select MENU No. 2. UP key : 1 push. Select MENU No. 3. | 02 Beep tone check 03 ch00 |

ADJUSTMENT

Receiver Section Adjustment

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|-------------------------|--|---|----------------------|------------------------------------|-----------------------------|--|--|---|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 1. RF GAIN | 1) CH : 00 (14.100.00, USB) RF GAIN : MAX | DC V.M | IF | CN10-5 | IF | VR10 | 3.0V | ±0.03V |
| 2. RIT | 1) RIT VR : Center | | | | Front panel | M.CH /VFO | Select MENU No. 4. UP key : 1 push | 04 Beep tone check |
| 3. IF SHIFT | 1) IF SHIFT VR : Center | | | | | | Select MENU No. 5. UP key : 1 push | 05 Beep tone check |
| 4. MCF | 1) MODE : FM Tracking generator Output : -30dBm Center f. : 73.05MHz | Spectrum analyzer Tracking generator | RF | TP2 TP1 | RF | L53~ L55 | Repeat 2~3 times. Adjust it to make gain maximum, and make the band flat as shown in the right. | Ripple : Within 1dB 73.05 73.043 73.057 |
| 5. LO2 | | Oscilloscope (100MHz) | RF | TP5 | RF | VR6 | 0.80Vp-p | ±0.05Vp-p |
| 6. IF AMP | 1) CH : 00 (14.100.00, USB) SSG f. : 14.10MHz SSG ATT : 40~-6dBμ Connect the YK-88S-1 to RF unit CN12 and CN13. | SSG DM. SP Oscilloscope AF V.M YK-88S-1 | Rear panel RF | ANT EXT. SP CN12 CN13 | Front panel RF IF | M.CH /VFO L71~ L73 L76 L77 L1 L6 L7 | Select MENU No. 6. Repeat 2~3 times. AF output MAX. | 06 |
| | 2) CH : Changeover | | | | Front panel | M.CH /VFO | Select MENU No. 3. UP key : 1 push | 03 ch00 03 ch01 |
| 7. Option filters check | 1) CH : 01 (14.099.50, USB) SSG ATT : 10dBμ Connect the filters to each connectors. | YK-88C-1 YK-455C-1 | RF IF | CN14 CN15 CN17 CN18 | Front panel | M.CH /VFO | Select NEMU No. 7. | 07 Signal shall be received. |
| | 2) CLEAR key : 1 push (Adjustment mode reset) | | | | | | | |
| 8. 8.83MHz MCF | 1) CH : 02 (14.100.00, USB) SSG f. : 14.10MHz SSG ATT : 0dBμ After adjusted disconnect the filters. | | | | RF | L74 L75 | Repeat 2 times. AF output MAX. | |
| 9. IF trap | 1) RF GAIN : MAX SSG f. : 73.050MHz SSG ATT : 100 → 80dBμ | | | | | TC1 TC2 | AF output MIN. | |
| 10. MIX BAL | 1) CH : 03 (0.100.00, USB) AF VR : MAX SSG RF : OFF After adjusted AF VR : MIN | | | | | VR1 | AF output MIN. | |
| 11. RF AMP | 1) CH : 04 (24.800.00, USB) SSG ATT : 0~-10dBμ (AGC shall not be applied.) | | | | | L35 | AF output MAX. | |
| | TS-690S 2) CH : 05 (53.800.00, USB) | | | | | L41 | AF output MAX. | |
| 12. FM IF AMP | 1) CH : 06 (28.800.00, FM) SSG ATT : 40dBμ SSG MOD : 1kHz SSG DEV : 3.0kHz | | | | IF | L9 | AF output MAX. | |
| 13. S-meter (FM) | 1) SSG ATT : 28dBμ | | | | | VR4 | S9 + 60dB | |

ADJUSTMENT

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|---|---|---|---------------|----------------|----------------------|--------------------|---|--|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| | 1) Adjustment mode setting POWER : OFF Pushing AIP, XIT and SCAN, POWER : ON | SSG DM. SP Oscilloscope AF V.M | Rear panel | ANT EXT. SP | Front panel | M.CH /VFO | Select MENU No. 3. UP key : 1 push | 03 ch06 03 ch07 |
| 14. S-meter (SSB) | 1) CH : 07 (14.100.00, USB) SSG RF : OFF | DC V.M | IF | TP (SM) | Front panel | M.CH | Select MENU No. 8. | 08 |
| (S1) | 2) SSG ATT : 6dB μ | | | | IF | VR5 VR1 | 0.6V Just after lighting of S1 (3 dots). | $\pm 0.01V$ |
| | | | | | | |  | |
| (S9) | 3) SSG ATT : 30dB μ | | | | | | UP key : 1 push | Beep tone check |
| (S9 + 60) | 4) SSG ATT : 90dB μ | | | | | | UP key : 1 push | Beep tone check |
| | 5) CH : Changeover | | | | Front panel | M.CH /VFO | Select MENU No. 3. UP key : 1 push | 03 ch07 03 ch08 |
| | 6) CH : 08 (28.800.00, USB) SSG ATT : 30dB μ | | | | | | Select MENU No. 9. UP key : 1 push | 09 Beep tone check |
| | 7) SSG ATT : 90dB μ | | | | | | UP key : 1 push | Beep tone check |
| TS-690S | 8) CH : Changeover | | | | | | Select MENU No. 3. UP key : 1 push | 03 ch08 03 ch09 |
| | 9) CH : 09 (50.100.00, USB) SSG ATT : 28dB μ | | | | | | Select MENU No. 10. UP key : 1 push | 10 Beep tone check |
| | 10) SSG ATT : 86dB μ | | | | | | UP key : 1 push | Beep tone check |
| Note : When UP key is erroneously pressed while setting S-meter, return the MENU No. by 1 to reset. | | | | | | | | |
| | 1) CLEAR key : 1 push (Adjustment mode reset) | | | | | | | |
| 15. Beep tone | 1) CH : 10 (14.100.00, USB) AF VR : MIN CW/FSK key : Push several times. | SSG DM. SP Oscilloscope AF V.M | Rear panel | ANT EXT. SP | IF | VR6 | 0.2Vp-p | $\pm 0.1Vp-p$ (0.1~0.3Vp-p) |
| 16. Notch | 1) NOTCH : ON MODE : USB SSG f. : 14.101.000MHz SSG ATT : 60dB μ | | | | IF Front panel | VR2 NOTCH VR | AF output MIN. with VR2 and NOTCH VR alternately. | AF level difference for NOTCH ON/OFF should be over 35dB. |
| | 2) SSG f. : 14.102.600MHz | | | | | | Check | NOTCH lights. |
| | 3) SSG f. : 14.100.500MHz After adjusted, NOTCH : OFF | | | | Front panel | NOTCH VR | AF output MIN. | AF level difference for NOTCH ON/OFF should be over 35dB. |
| 17. NB | 1) Noise generator level : S5~S9 (S-meter) NB SW : 1 push | Noise generator EXT. SP | Rear panel | ANT EXT. SP | | | Check | NB1 lights. |
| | 2) NB SW : Push several times. Display : NB2/OFF | DC V.M | RF | TP4 | RF | L86 L87 | Voltage MIN. | |
| | 3) NB SW : Push several times. Display : NB1/OFF After adjusted, NB : OFF | | | | | | Adjust the noise generator output to S-meter 5 and 9 dots lights. | Noise disappears. Whenever NB SW is pressed, the display changes in sequence of NB1 - NB2 - OFF. |
| 18. RF ATT | 1) ATT SW : ON After checked, ATT SW : OFF | SSG DM. SP Oscilloscope AF V.M | Rear panel | ANT EXT. SP | | | S9 | 52 \pm 6dB μ (46~58dB μ) |
| 19 RF GAIN | 1) RF GAIN : MIN SSG ATT : 60dB μ After checked, RF GAIN : MAX | | | | | | Check | S-meter scale over. No AF output. |

ADJUSTMENT




| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|-------------------|---|----------------------------------|------------|----------|-------------|-------------|---|--|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 20. AGC | 1) AGC : 1 push (FAST) | SSG | Rear panel | ANT | | | Check the display of S-meter by turning SSG RF ON/OFF from the receiving state of signal. | FAST lights. It should move quickly. |
| | 2) AGC : 1 push (SLOW) | DM. SP Oscilloscope AF V.M | | EXT. SP | | | | SLOW lights. It moves slowly as compared with FAST. |
| 21. Voice | 1) VS-2 installed model only POWER : ON | VS-2 | | | | Front panel | VOICE key : 1 push | The displayed frequency can be heard vocally. |
| 22. S/N | 1) CH : Indicated below AF VR : 1.0V/8Ω SSG f. : Indicated below However, USB : +1kHz LSB : -1kHz | | | | | | | Note : As AIP will be turned on automatically at frequencies of 9.5kHz or less, turn it off with the AIP SW. |
| | M. CH Frequency MODE SSG ATT SSG MOD SSG DEV | | | | | | | |
| | 11 550kHz AM 36dBμ 1kHz 30% | | | | | | S/N measurement | 10dB or more |
| | 12 1.550MHz AM 36dBμ 1kHz 30% | | | | | | | |
| | 13 1.800MHz LSB -6dBμ OFF | | | | | | S/N measurement MAX sensitivity measurement | 10dB or more 0.7V/8Ω or more |
| | 14 3.550MHz LSB -6dBμ OFF | | | | | | | |
| | 15 7.100MHz LSB -6dBμ OFF | | | | | | | |
| | 16 10.100MHz USB -6dBμ OFF | | | | | | | |
| | 17 14.100MHz USB -6dBμ OFF | | | | | | | |
| | 18 21.100MHz USB -6dBμ OFF | | | | | | | |
| | 19 24.800MHz USB -9dBμ OFF | | | | | | SINAD sensitivity measurement | 12dB or more |
| | 20 28.800MHz USB -9dBμ OFF | | | | | | | |
| | 21 29.800MHz FM -6dBμ 1kHz ±3kHz | | | | | | S/N masurement MAX sensitivity measurement | 10dB or more 0.7V/8Ω or more |
| | 22 51.100MHz FM -6dBμ 1kHz ±3kHz | | | | | | | |
| | 23 50.100MHz USB -10dBμ OFF | | | | | | | |
| | 24 53.800MHz USB -10dBμ OFF | | | | | | | |
| 23. Squelch (SSB) | 1) CH : 25 (14.100.00, USB) SQL VR : Center SSG RF : OFF | SSG | Rear panel | ANT | IF | VR3 | Set to the point squelch closes. | |
| | 2) SSG f. : 14.101.000MHz SSG ATT : 8dBμ | DM. SP Oscilloscope AF V.M | | EXT. SP | | | Check | Squelch should open. |
| | 3) SQL VR : MAX | | | | | | | Squelch should close. |
| | 4) SSG ATT : 30dBμ After checked, SQL VR : MIN | | | | | | | Squelch should open |
| 24. Squelch (FM) | 1) CH : 26 (28.800.00MHz, FM) SSG RF : OFF | | | | Front panel | SQL VR | Adjust SQL VR is slowly increase noise just goes off. | Knob position 8 : 00-12 : 00 |
| | 2) SSG f. : 28.800.00MHz SSG ATT : -14dBμ SSG MOD : 1kHz SSG DEV : 3.0kHz | | | | | | Check | Squelch should open. |
| | 3) SQL VR : MAX | | | | | | | Squelch should close |
| | 4) SSG ATT : 0dBμ After checked, SQL VR : MIN | | | | | | | Squelch should open. |

ADJUSTMENT

Transmitter Section Adjustment

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|--------------------------------|---|--------------------------|------------|---------------------------------|---------------------|--|--|--|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 1. ALC voltage | 1) CH : 27 (29.600.00, CW) | DC V.M | RF | CN1-7 (ALC) | IF | VR14 | 2.5V | +0.05V, -0.0V |
| 2. TX AMP | 1) RF unit VR2 : Center CAR VR : 10 : 00~11 : 00 PWR VR : MAX STBY : SEND | 50Ω load Oscilloscope | RF | CN9 | RF | L66~ L68 L89 L91~ L94 | Repeat 2~3 times for MAX. L91 takes the peak in the core drawing direction. | 10dBm or more. |
| 3. MIX BIAS | 1) STBY : SEND | | | | | VR4 | MAX. | 10dBm or more. |
| | 2) CH : 28 (53.500.00, CW) TS-690S except E2 CH : 29 (51.900.00, CW) TS-690S E2 After adjusted, RF unit CN9 connect. | | | | | VR3 | MAX. | 10dBm or more. |
| 4. 50MHz AMP TS-690S | 1) CH : 29 (51.900.00, CW) PWR VR : MAX CAR VR : 10W or less STBY : SEND | Power meter | Rear panel | ANT | 50M 10W Final | TC1 | MAX. | |
| 5. 50MHz final bias TS-690S | 1) CH : 29 (51.900.00, CW) CAR VR : MIN MIC VR : MIN Final unit VR1 : MIN STBY : SEND | Ammeter | | | 50M 50W Final | | Record current at VR1 is MIN. | This current is total current. |
| 6. HF final bias | 1) CH : 31 (14.200.00, CW) CAR VR : MIN MIC VR : MIN Final unit VR1, VR2 : MIN STBY : SEND | | | | VR1 | Total current + 250mA. | | |
| | | | | | | Record current at VR1 and VR2 are MIN. | This current is total current. | |
| | | | | | VR1 | Total current + 250mA. | | |
| | | | VR2 | (Total current + 250mA) + 250mA | | | | |
| 7. NULL | 1) CH : 30 (3.500.00, CW) CAR VR : 10W STBY : SEND | DC V.M | Filter | CN8-1 | Filter | TC1 | MIN | |
| 8. ALC | 1) CH : 31 (14.200.00, CW) IF unit VR20 : Center CAR VR : Increasingly MAX. STBY : SEND | | | | IF | VR15 | 105W | ±5W |
| 9. ALC frequency response | 1) CH : 33 (29.600.00, CW) STBY : SEND | | | | Filter | VR1 | 105W | ±5W |
| 10. Power down 50W | 1) CH : 34 (53.500.00, CW) TS-690S except E2 CH : 35 (51.900.00, CW) TS-690S E2 STBY : SEND | Power meter | Rear panel | ANT | IF | VR17 | Mechanical center point | |
| 11. MIN power | 1) CH : 38 (14.200.00, CW) PWR VR : MIN CAR VR : MAX STBY : SEND After adjusted, PWR VR : MAX | | | | | VR19 | 51W | ±1W |
| | | | | | IF | VR18 | 10.0W | ±1.0W |
| 12. Power meter | 1) PWR VR : 88W STBY : SEND | | | | | VR21 | 90W Then, set display PWR meter just after one disappears. | After adjustment, turn the PWR VR while setting 2~1W up and display dots light as shown in the left. |
| | 1) Adjustment mode setting POWER : OFF Holding AIP, XIT and SCAN, POWER : ON | | | | Front panel | M.CH /VFO | Select MENU No. 3 UP key : 1 push | 03 ch38 03 ch39 |

ADJUSTMENT

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|-----------------------------|--|--|------------|----------|-------------|------------------------|---|--|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 13. CAR point | 1) CH : 39 (14.200.00, USB) MIC terminal : 2 tone AG1 : 300Hz/5mV AG2 : 2700Hz/5mV MIC VR : Level at which not activated. STBY : SEND | Power meter Oscilloscope | Rear panel | ANT | Front panel | M.CH /VFO | Select MENU No. 11 or No. 12. Adjust so that waveform cross by UP and DOWN key. | OK  NG  |
| 14. ALC meter (Start point) | 1) PWR VR : MAX MIC terminal : Single tone AG1 : 1kHz/5mV STBY : SEND | | | | Front panel | M.CH /VFO MIC VR | Select MENU No. 13. Adjust so that ALC meter one dot lights with MIC VR. UP key : 1 push | 13  Beep tone check |
| (Zone MAX) | 2) AG1 : 1kHz/10mV STBY : SEND | | | | | | UP key : 1 push | Beep tone check |
| (Full scale) | 3) AG1 : 1kHz/20mV STBY : SEND | | | | | | UP key : 1 push | Beep tone check |
| | 4) AG1 : 1kHz/2mV CAR VR, PWR VR : MAX MIC VR : MAX STBY : SEND | | | | RF | L92 | In the core drawing direction, set it to the indication start point of ALC meter. (Just before ALC meter one dot lights) | |
| 15-1. Power down 10W | 1) CH : Changeover | | | | Front panel | M.CH /VFO | Select MENU No. 3. DWN key : 1 push | 03 ch39 03 ch38 |
| | 2) CH : 3B (14.200.00, CW) AT10 : Compulsory ON | | | | | | Select MENU No. 16. UP key : 1 push | 16 off 16 on |
| | 3) STBY : SEND | | | | IF | VR20 | 11W | ±1W |
| | 4) After adjusted, AT10 : Reset | | | | Front panel | | DWN key : 1 push | 16 off |
| 16. EEPROM data write | 1) After writing, CLEAR key : 1 push (Adjustment mode reset) Note : be sure to write this data when making readjustment of the following items in repair. (RF G, RIT, IF SHIFT, S-meter, CAR point, ALC meter) | | | | Front panel | M.CH /VFO | Select MENU No. 17. UP key : 1 push | 17 Beep tone check |
| 15-2. Power down 10W E2 | 1) CH : 37 (1.840.00, CW) STBY : SEND | | | | | | Check | 10-12W |
| 17. CAR suppression | 1) CH : 39 (14.200.00, USB) MIC VR : MIN MODE : USB/LSB STBY : SEND | Power meter Coupler Spectrum analyzer (Oscilloscope) | Rear panel | ANT | IF | VR8 VR9 | MIN. (adjust alternately). Adjust for no difference between USB and LSB. | -60dB or less. |
| 18. Spurious | 1) CH : 40 (53.900.00, CW) Connect to the spectrum analyzer to RF unit CN9. STBY : SEND | Spectrum analyzer | RF | CN9 | RF | VR5 | 53.9MHz ± 1.5MHz Spurious : MIN Except TS-450S and TS-690S (E2) Mechanical center point TS-450S, TS-690S (E2) | -60dB or less. |
| | 2) CH : 41 (21.200.00, CW) STBY : SEND After adjusted, connect the CN9. | | | | | VR2 | Near 11MHz Spurious : MIN. | -50dB or less. |

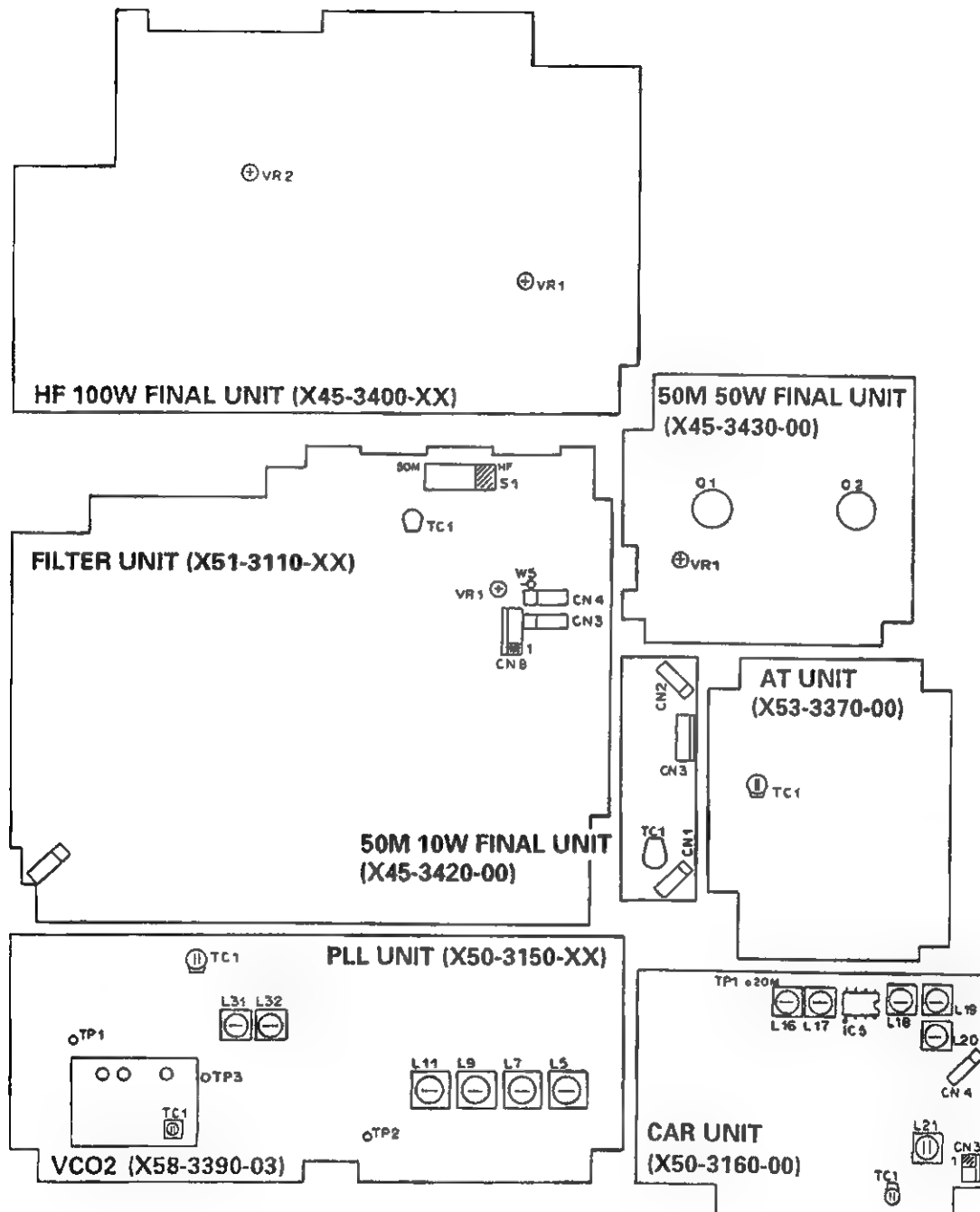
TS-450S/690S

ADJUSTMENT

| Item | Condition | Measurement | | | Adjustment | | | Specifications/Remarks |
|--|---|---|-------------------------------|-------------------|------------|-------|------------------------------------|-----------------------------|
| | | Test-equipment | Unit | Terminal | Unit | Parts | Method | |
| 19. SWR protection | 1) CH : 42 (14.200.00, CW) CAR VR : MAX PWR VR : MAX STBY : SEND | Through-type power meter 150Ω dummy | Rear panel | ANT | IF | VR16 | 40W | ±1.0W |
| 20. SWR meter | 1) CH : 43 (1.840.00, CW) TX M : 1 push STBY : SEDN | | | | | | Display check | SWR lights. |
| | | | | | | VR22 | Adjust just after SWR3 dot lights. | |
| 21. FM MAX DEV (WIDE) | 1) CH : 44 (28.700.00, FM) MIC terminal : Single tone AG1 : 1kHz/30mV X,E,E2 AG1 : 1kHz/50mV K,M,M2,P STBY : SEND | Power meter Coupler Linear detector AG AF V.M | Rear panel Front panel | ANT MIC | IF | VR11 | ±4.6kHz | ±0.1kHz |
| 22. FM MIC sensitivity (WIDE) | 1) AG1 : 1kHz/3mV X,E,E2 AG1 : 1kHz/5mV K,M,M2,P STBY : SEND | | | | | VR23 | ±3.0kHz | ±0.1kHz |
| 23. FM MAX DEV (NARROW) | 1) 455 key : 1 push (6K) AG1 : 1kHz/30mV X,E,E2 AG1 : 1kHz/50mV K,M,M2,P STBY : SEND | | | | | VR12 | ±2.3kHz | ±0.1kHz |
| 24. FM MIC sensitivity (NARROW) | 1) AG1 : 1kHz/3mV X,E,E2 AG1 : 1kHz/5mV K,M,M2,P STBY : SEND After checked, 455 key : 1 push (12K) | | | | | | Check | ±1.4~1.6kHz |
| 25. Sub tone (Option TU-8 installed model) | 1) MIC terminal : Open SPLIT : ON TONE : ON STBY : SEND | TU-8 | IF | W3 | | | Check | Tone appear. ±0.5~0.9kHz |
| 26. Processor | 1) CH : 45 (14.200.00, CW) MODE : USB MIC terminal : Single tone AG : 1kHz/10mV MIC VR : 50W STBY : SEND | | | | | | | |
| | 2) AG : 1kHz/1mV PROC SW : ON STBY : SEND | | | | | | Check | Within ±3dB |
| 27. Side tone level | 1) MODE : CW AF VR : Center Key : Down | DM. SP AF V.M Key | Rear panel | EXT. SP CW key | IF | VR7 | 0.2V/8Ω | 0.18~0.22V |

ADJUSTMENT

Adjustment Points (Upper)



FILTER UNIT (X51-3110-XX)
 TC1 : NULL
 VR1 : ALC frequency response

HF 100W FINAL UNIT (X45-3400-XX)
 VR1,2 : Final bias

PLL UNIT (X50-3150-XX)
 L5,7,9,11 : VCO
 L31,32 : PLL IF BPF
 TC1 : Reference OSC

VCO2 (X58-3390-03)
 TC1 : VCO2

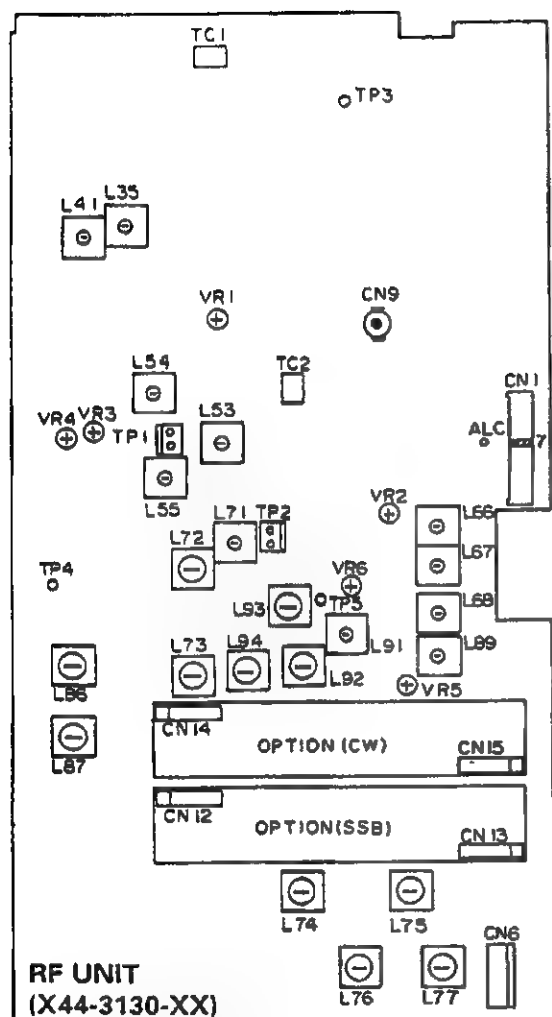
50M 50W FINAL UNIT (X45-3430-00)
 VR1 : Final bias

50M 10W FINAL UNIT (X45-3420-00)
 TC1 : 50M AMP

CAR UNIT (X50-3160-00)
 L16,17 : 60MHz BPF
 L18~20 : DLO
 L21 : LO3 (8.375MHz)
 TC1 : LO3 (8.375MHz)

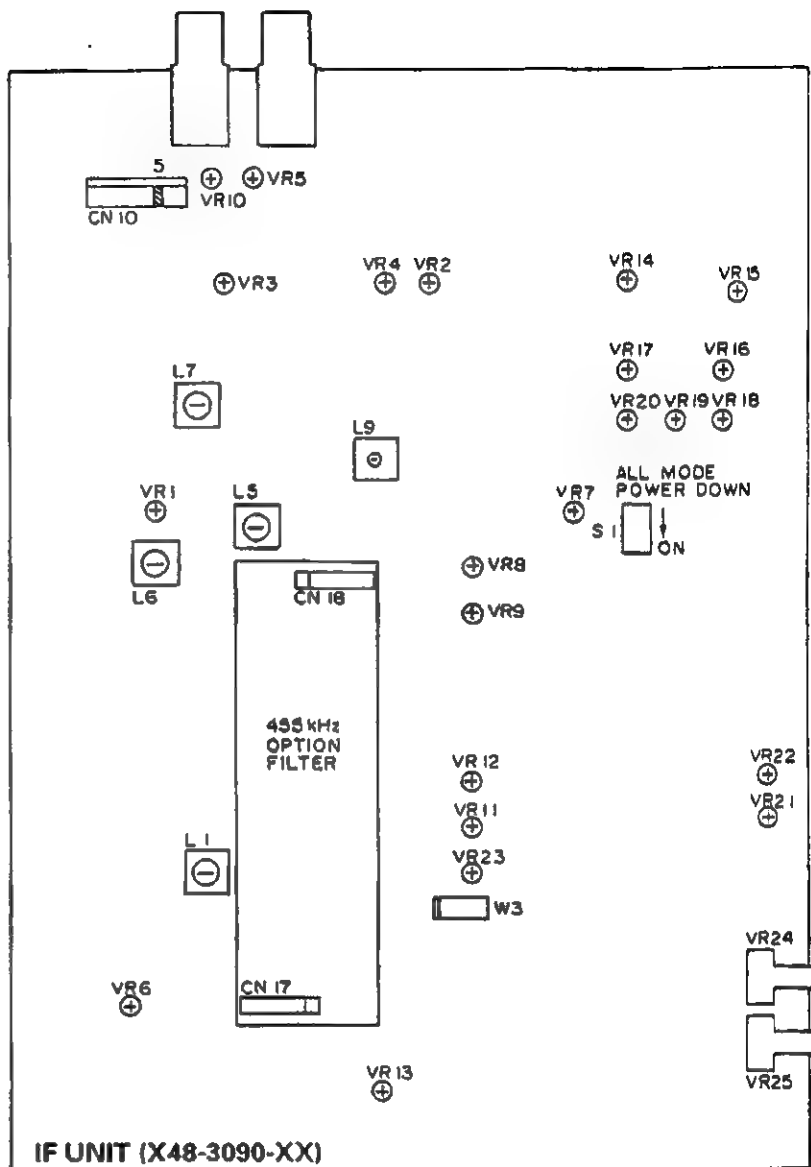
ADJUSTMENT

Adjustment Points (Lower)



RF UNIT (X44-3130-XX)

L35 : RF AMP
L41 : RF AMP
L53-55 : MCF
L66-68,89,91-94 : TX AMP
L71-73,76,77 : IF AMP
L74,75 : 8.83MHz MCF
L86,87 : NB
L92 : ALC meter
TC1,2 : IF trap
VR1 : MIX BAL
VR2 : Spurious
VR3,4 : MIX BIAS
VR5 : Spurious
VR6 : LO2



IF UNIT (X48-3090-XX)

L1,6,7 : IF AMP
L5 : Setting
L9 : FM IF AMP
VR1 : S-meter (S1)
VR2 : Notch
VR3 : Squelch (SSB)
VR4 : S-meter (FM)
VR5 : S-meter (SSB)
VR6 : Beep tone
VR7 : Side tone level
VR8,9 : CAR suppression
VR10 : RFG
VR11 : FM MAX DEV (WIDE)
VR12 : FM MAX DEV (NARROW)

VR13 : Setting
VR14 : ALC voltage
VR15 : ALC
VR16 : SWR protection
VR17,19 : Power down 50W
VR18 : MIN power
VR20 : Power down 10W
VR21 : Power meter
VR22 : SWR Meter
VR23 : FM MIC sensitivity (WIDE)

TERMINAL FUNCTION

| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|----------------------------------|--------------|---------------|-----|---|
| SWITCH UNIT (X41-3170-00) | | | | |
| CN1 | 1 | PH3 | - | Phone jack GND. |
| | 2 | PH2 | O | Phone jack speaker signal (Off when phone install). |
| | 3 | SPK | I | Phone jack speaker signal (Off when phone install). |
| CN2 | 1 | FM SQ1 | I | Squelch volume voltage 1 (FM). |
| | 2 | NFM SQ2 | O | Squelch volume voltage 2 (except FM). |
| | 3 | NTR | I | Notch volume voltage. |
| | 4 | NFM SQ1 | I | Squelch volume voltage 1 (except FM). |
| | 5 | NTG | O | Notch volume voltage GND. |
| | 6 | FM SQ2 | O | Squelch volume voltage 2 (FM). |
| CN3 | 1 | AV2 | O | AF volume signal 2. |
| | 2 | GND | - | GND. |
| | 3 | AV1 | I | AF volume signal1. |
| | 4 | GND | - | GND. |
| | 5 | RIB | I | RIT reference voltage (5V). |
| | 6 | IFB | O | IF shift reference voltage (5V). |
| | 7 | RIT | I | RIT volume voltage. |
| | 8 | IFS | O | IF shift volume voltage. |
| | 9 | GND | - | GND. |
| CN4 | 1 | PC2 | O | Power control volume voltage 2. |
| | 2 | PC1 | I | Power control volume voltage 1. |
| | 3 | MIC VR1 | I | MIC volume signal 1. |
| | 4 | MIC VR2 | O | MIC volume signal 2. |
| | 5 | GND | - | GND. |
| | 6 | GND | - | GND. |
| | 7 | CV | O | Carrier volume voltage. |
| | 8 | TXB | I | Transmission power (8V). |
| CN5 | 1 | NC | - | |
| | 2 | DVR2 | O | Delay volume voltage 2. |
| | 3 | DVR1 | I | Delay volume voltage 1. |
| CN6 | 1 | GND | - | GND. |
| | 2 | CK4 | O | Sub encoder pulse 4 signal. |
| | 3 | CK3 | O | Sub encoder pulse 3 signal. |
| CN7 | 1 | RFG2 | O | RF GAIN volume voltage 2. |
| | 2 | RFG1 | I | RF GAIN volume voltage 1. |
| RF UNIT (X44-3130-XX) | | | | |
| CN1 | 1 | 14V | I | 14V. |
| | 2 | 8V | I | 8V. |
| | 3 | RL | I | Relay power supply (14V). Relay |
| | 4 | TXB | I | Transmission power supply (8V). |
| | 5 | RXB | I | Reception power supply (8V). |
| | 6 | AGC | I | AGC voltage (3.0V when full gain). |
| | 7 | ALC | I | ALC voltage (2.5V when full gain). |
| | 8 | 50MC | O | 50MHz band data. ("L" when 40.5-60MHz) |
| | 9 | AMB | I | AM mode voltage (8V). |
| | 10 | CKY | I | Keying control signal. |
| | 11 | 28MC | O | 28MHz band data. ("L" when 21.5-40.5MHz) |
| | 12 | RBC | I | Reception control signal. "L" : RX |
| | 13 | AIPB | O | AIP off voltage (8V). |
| | 14 | RFPC | I | Power control voltage. |
| | 15 | GND | - | GND. |
| CN2 | 1 | RDA | I | RF serial data. |
| | 2 | RCK | I | RF serial clock. |
| | 3 | RLE1 | I | RF serial enable 1. |
| | 4 | RLE2 | I | RF serial enable 2. |
| | 5 | RBK | I | RF blanking signal. "H" : Active |
| | 6 | NC | - | |

| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|---------------|--------------|---------------|-----|--|
| | 7 | NC | - | |
| | 8 | TS | I/O | AT-300 control signal. Relay |
| | 9 | TT | I/O | AT-300 control signal. Relay |
| | 10 | GND | - | GND. |
| CN3 | 1 | TB0 | O | Transmission LPF select. "L" : Active |
| | 2 | TB1 | O | Transmission LPF select. "L" : Active |
| | 3 | TB2 | O | Transmission LPF select. "L" : Active |
| | 4 | TB3 | O | Transmission LPF select. "L" : Active |
| CN4 | 1 | RL | O | Relay voltage (14V). Relay |
| | 2 | 14V | O | 14V. |
| | 3 | GND | - | GND. |
| CN5 | 1 | TT | I/O | AT-300 control signal. Relay |
| | 2 | TS | I/O | AT-300 control signal. Relay |
| CN6 | 1 | TIF | I | Transmission IF signal (455kHz). |
| | 2 | GND | - | GND. |
| | 3 | RIF | O | Reception IF signal (455kHz). |
| | 4 | GND | - | GND. |
| CN7 | 1 | LO3 | I | Local 3 signal (8.375MHz). |
| | 2 | GND | - | GND. |
| CN8 | 1 | RAT | I | Reception antenna signal. |
| | 2 | GND | - | GND. |
| CN9 | Coaxial | DRV | - | Drive signal. |
| CN10 | Coaxial | LO1 | I | Local 1 signal (VCO). |
| CN11 | Coaxial | LO2 | I | Local 2 signal (84.22MHz). |
| CN501 | 1 | SS | O | Standby switch. "L" : TX. Relay |
| | 2 | TXB | I | ON AIR LED (8V when lights). |
| | 3 | S0 | I | |
| | 4 | S1 | I | |
| | 5 | S2 | I | |
| | 6 | S3 | I | |
| | 7 | S4 | I | |
| | 8 | S5 | I | |
| | 9 | NC | - | |
| | 10 | K0 | O | |
| | 11 | K1 | O | |
| | 12 | K2 | O | |
| | 13 | K3 | O | |
| | 14 | K4 | O | |
| | 15 | K5 | O | |
| | 16 | K6 | O | |
| | 17 | ATL | I | |
| | 18 | NC | - | |
| | 19 | NC | - | |
| | 20 | GND | - | GND. |
| CN502 | 1 | GND | - | GND. |
| | 2 | SS | I | Standby switch. "L" : TX |
| | 3 | S5 | O | Key matrix. "H" : Not select, "L" : Select |
| | 4 | K0 | I | Key matrix. "H" : Off, "L" : On |
| | 5 | K1 | I | Key matrix. "H" : Off, "L" : On |
| | 6 | K2 | I | Key matrix. "H" : Off, "L" : On |
| W501 | 1 | SS | O | Standby switch. "L" : TX |
| | 2 | GND | - | GND. |
| | 3 | MD | O | MIC down switch. |
| | 4 | MU | O | MIC up switch. |
| | 5 | 8M | I | MIC power supply (8V). |
| | 6 | MG | - | MIC GND. |
| | 7 | MIC | O | MIC signal. |
| W502 | 1 | GND | - | GND. |
| | 2 | SS | O | Standby switch. "L" : TX Relay |

TERMINAL FUNCTION

| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|---|--------------|---------------|-----|--|
| | 3 | S5 | I | Key matrix. "H" : Not select, "L" : Select. Relay |
| | 4 | K0 | O | Key matrix. "H" : Off, "L" : On |
| | 5 | K1 | O | Key matrix. "H" : Off, "L" : On |
| | 6 | K2 | O | Key matrix. "H" : Off, "L" : On |
| FINAL UNIT (X45-3400-XX) : HF 100W | | | | |
| CN1 | Coaxial | HFPO | O | HF final signal. |
| CN2 | 1 | 14VAF | O | AF PA power supply (14V). |
| | 2 | 14V | O | 14V. |
| | 3 | 14V | O | 14V. |
| | 4 | 8V | O | 8V. |
| | 5 | 5V | O | 5V. |
| | 6 | 8V | O | 8V. |
| | 7 | GND | - | GND. |
| | 8 | GND | - | GND. |
| CN3 | 1 | 5V | O | 5V. |
| | 2 | 8V | O | 8V. |
| | 3 | GND | O | GND. |
| CN4 | 1 | HFHG | O | HF final decision. |
| | 2 | 50HG | O | 50MHz final decision. Relay |
| | 3 | 50B | I | 50MHz band power supply (8V when 40.5-60MHz). |
| | 4 | TXB | I | Transmission power supply (8V). |
| | 5 | PT | O | Protection signal. |
| CN6 | 1 | GND | - | GND. |
| | 2 | 14S | O | 50MHz 10W power supply (14V). |
| | 3 | 14S | O | 50MHz 10W power supply (14V). |
| | 4 | 50T | O | 50MHz transmission power supply (8V). |
| CN7 | Coaxial | 50D | O | 50MHz drive signal. |
| CN8 | 1 | M+ | O | Fan motor drive +. |
| | 2 | M- | O | Fan motor drive -. |
| CN9 | 1 | M+ | O | Fan motor drive +. |
| | 2 | M- | O | Fan motor drive -. |
| W1 | Coaxial | DRV | I | Drive signal. |
| W2 | 1 | 14 | I | External power supply (14V). |
| | 2 | GND | - | GND. |
| | 3 | NC | - | |
| | 4 | 14 | I | External power supply (14V). |
| | 5 | GND | - | GND. |
| | 6 | NC | - | |
| W3 | | 14S | O | AT-300 power supply (14V). |
| W4 | 1 | 14 | O | 50MHz 50W power supply (14V). |
| | 2 | GND | - | GND. |
| W5 | 1 | 14S | I | Power switch (14V). |
| | 2 | 14 | O | Power switch (14V). |
| W6 | 1 | 50T | O | 50MHz 50W transmission power supply (8V). |
| | 2 | 50PT | I | 50MHz protection signal. |
| | 3 | 14S | O | 50MHz 50W power supply. |
| | 4 | 50HG | I | 50MHz final decision signal. Relay |
| FINAL UNIT (X45-3420-00) : 50MHz 10W | | | | |
| CN1 | Coaxial | 50D | I | 50MHz drive signal. |
| CN2 | Coaxial | 10WPO | O | 50MHz 10W final signal. |
| CN3 | 1 | GND | - | GND. |
| | 2 | 14S | I | 50MHz 10W power supply (14V). |
| | 3 | 14S | I | 50MHz 10W power supply (14V). |
| | 4 | 50T | I | 50MHz transmission power supply (8V). |

| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|---|--------------|---------------|-----|---|
| FINAL UNIT (X45-3430-00) : 50MHz 50W | | | | |
| CN1 | Coaxial | 50WD | I | 50MHz drive signal. |
| CN2 | 1 | 50HG | O | 50MHz final decision signal. |
| | 2 | 50PT | O | 50MHz protection signal. |
| | 3 | 50T | I | 50MHz 50W transmission power supply (8V). |
| | 4 | 14S | I | 50MHz 50W power supply (14V). |
| CN3 | 1 | M+ | O | Fan motor drive +. |
| | 2 | M- | O | Fan motor drive -. |
| W1 | Coaxial | 50WPO | O | 50MHz 50W final signal. |
| W2 | 1 | 14 | I | 50MHz 50W power supply (14V). |
| | 2 | GND | - | GND. |
| DIGITAL UNIT (X46-312X-XX) | | | | |
| CN1 | 1 | GND | - | GND. |
| | 2 | LBL | O | LCD all light off. "L" : All light off, "H" : Display on |
| | 3 | NC | - | |
| | 4 | LLE2 | O | LCD enable 2. |
| | 5 | LLE1 | O | LCD enable 1. |
| | 6 | LCK | O | LCD clock. |
| | 7 | LDA | O | LCD data. |
| | 8 | LLE3 | O | IF filter LED enable 3. |
| | 9 | 8V | O | 8V. Relay |
| | 10 | 5V | O | 5V. |
| CN2 | 1 | GND | - | GND. |
| | 2 | IFS | I | IF shift volume voltage. |
| | 3 | IFB | O | IF shift reference voltage (5V). |
| | 4 | RII | I | RII volume voltage. |
| | 5 | RIB | O | RII reference voltage (5V). |
| CN3 | 1 | MU | I | MIC up switch. |
| | 2 | MD | I | MIC down switch. |
| CN4 | 1 | FDA | O | IF serial data. |
| | 2 | FCK | O | IF serial clock. |
| | 3 | FLE1 | O | IF serial enable 1. |
| | 4 | FLE2 | O | IF serial enable 2. |
| | 5 | TOB | O | Tone unit control voltage. |
| | 6 | LIN | O | Linear standby relay control signal. "H" : Active |
| | 7 | ABK | O | AF blanking signal. "H" : Active |
| | 8 | TXI | O | Transmission band data. "L" : Active |
| | 9 | CSS | I | Standby for microprocessor. "L" : TX |
| | 10 | SS | O | Standby switch. "L" : TX |
| | 11 | TXB | I | ON AIR LED (8V when lights). Relay |
| | 12 | 50HG | I | 50MHz final decision voltage. |
| | 13 | HFHG | I | HF final decision voltage. |
| | 14 | RFM | I | Power meter signal. |
| | 15 | ALDB | I | Audio volume meter signal, ALC meter signal. |
| | 16 | REV | I | Reflector meter signal. |
| | 17 | SM | I | S-meter signal. |
| | 18 | DBC | I | DSP connection voltage. "L" : DSP instal |
| | 19 | NC | - | |
| | 20 | GND | - | GND. |
| CN5 | 1 | VB0 | O | VCO band data 0. |
| | 2 | VB1 | O | VCO band data 1. |
| | 3 | VB2 | O | VCO band data 2. |
| | 4 | VB3 | O | VCO band data 3. |
| | 5 | PLE1 | O | PLL enable 1. |
| | 6 | PCK | O | PLL clock. |
| | 7 | PLE2 | O | PLL enable 2. |
| | 8 | PDA | O | PLL data. |

TERMINAL FUNCTION

| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|---------------|--------------|---------------|-----|--|
| | 9 | BCH | O | PLL band-pass changeover. |
| | 10 | UL | I | PLL unlock data. "L" : Unlock |
| | 11 | 14V | O | 14V. Relay |
| | 12 | GND | - | GND. |
| CN6 | 1 | CDA | O | CAR DDS data. |
| | 2 | CCK | O | CAR DDS clock. |
| | 3 | CLE1 | O | CAR DDS enable 1. |
| | 4 | ABSL | O | DDS channel A/B changeover. |
| | 5 | CLE2 | O | CAR DDS enable 2. |
| | 6 | CASL | O | DDS channel A/B changeover. |
| | 7 | NC | - | |
| | 8 | GND | - | GND. |
| CN7 | 1 | GND | - | GND. |
| | 2 | 5V | I | 5V. |
| | 3 | 8V | I | 8V. Relay |
| | 4 | 14V | I | 14V. Relay |
| CN8 | 1 | 5S | O | 5V. |
| | 2 | CK1 | I | Main encoder pulse 1 signal. |
| | 3 | CK2 | I | Main encoder pulse 2 signal. |
| | 4 | GND | - | GND. |
| CN9 | 1 | POD1 | I | Variable condenser position recognition signal 1. |
| | 2 | POD2 | I | Variable condenser position recognition signal 2. |
| | 3 | VREF | O | AT reference voltage (5V). |
| | 4 | ATG | - | AT GND. |
| | 5 | PR22 | O | Motor rotate direction control 4. |
| | 6 | PR21 | O | Motor rotate direction control 3. |
| | 7 | PR12 | O | Motor rotate direction control 2. |
| | 8 | PR11 | O | Motor rotate direction control 1. |
| | 9 | ATA | O | AUTO/THRU switch. "H" : AUTO, "L" : THRU |
| | 10 | APRE | O | Preset control changeover. "H" : Auto, "L" : Preset |
| | 11 | SPED | O | Motor speed control. "H" : Go, "L" : Stop |
| | 12 | AT1 | I | Preset AT install. "L" : Install |
| | 13 | 14V | O | 14V. Relay |
| | 14 | 5V | O | 5V. |
| | 15 | GND | - | GND. |
| | 16 | GND | - | GND. |
| CN10 | 1 | GND | - | GND. |
| | 2 | 5C | O | 5V. |
| | 3 | STR | O | VS-2 voice start. "H" : Start |
| | 4 | BSY | O | VS-2 busy. "H" : Voice synthesizer signal out |
| | 5 | SCK | O | VS-2 voice clock. |
| | 6 | SD | O | VS-2 voice data. |
| CN11 | 1 | RDA | O | RF serial data. |
| | 2 | RCK | O | RF serial clock. |
| | 3 | RLE1 | O | RF serial enable 1. |
| | 4 | RLE2 | O | RF serial enable 2. |
| | 5 | RBK | O | RF blanking signal. "H" : Active |
| | 6 | NC | - | |
| | 7 | NC | - | |
| | 8 | TS | I/O | AT-300 control signal. |
| | 9 | TT | I/O | AT-300 control signal. |
| | 10 | GND | - | GND. |
| CN12 | 1 | CK3 | I | Sub encoder pulse 3 signal. |
| | 2 | CK4 | I | Sub encoder pulse 4 signal. |
| | 3 | GND | - | GND. |

| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|-----------------------|--------------|---------------|-----|--|
| CN13 | 1 | GND | - | GND. |
| | 2 | NC | - | |
| | 3 | NC | - | |
| | 4 | ATL | O | AT TUNE LED (5V when lights). |
| | 5 | K6 | I | Key matrix. "H" : Off, "L" : On |
| | 6 | K5 | I | Key matrix. "H" : Off, "L" : On |
| | 7 | K4 | I | Key matrix. "H" : Off, "L" : On |
| | 8 | K3 | I | Key matrix. "H" : Off, "L" : On |
| | 9 | K2 | I | Key matrix. "H" : Off, "L" : On |
| | 10 | K1 | I | Key matrix. "H" : Off, "L" : On |
| | 11 | K0 | I | Key matrix. "H" : Off, "L" : On |
| | 12 | NC | - | |
| | 13 | S5 | O | |
| | 14 | S4 | O | |
| | 15 | S3 | O | Key matrix. "H" : Not select, "L" : Select |
| | 16 | S2 | O | |
| | 17 | S1 | O | |
| | 18 | S0 | O | |
| | 19 | TXB | O | ON AIR LED (8V when lights). Relay |
| | 20 | SS | I | Standby switch. "L" : TX |
| CN14 | 1 | BZ | O | Buzzer signal. |
| | 2 | GND | - | Buzzer signal GND. |
| IF UNIT (X48-3090-XX) | | | | |
| CN1 | 1 | 14V | O | 14V. |
| | 2 | 8V | O | 8V. |
| | 3 | RL | O | Relay power supply (14V). |
| | 4 | TXB | O | Transmission power supply (8V). |
| | 5 | RXB | O | Reception power supply (8V). |
| | 6 | AGC | O | AGC voltage (2.8V when full gain). |
| | 7 | ALC | O | ALC voltage (3.0V when full gain). |
| | 8 | 50MC | I | 50MHz band data. "L" when 40.5~60MHz |
| | 9 | AMB | O | AM mode voltage (8V). |
| | 10 | CKY | O | Keying control signal. |
| | 11 | 28MC | I | 28MHz band data. "L" when 21.5~40.5MHz |
| | 12 | RBC | O | Receive control signal. "L" : RX |
| | 13 | AIPB | I | AIP off voltage (8V). |
| | 14 | RFPC | O | Power control voltage. |
| | 15 | GND | - | GND. |
| CN2 | 1 | CAR | I | CAR signal (455kHz). |
| | 2 | GND | - | GND. |
| CN3 | 1 | FMM | O | FM modulation signal. |
| | 2 | GND | - | GND. |
| CN4 | 1 | MIC VR2 | I | MIC volume signal 2. |
| | 2 | GND | - | GND. |
| | 3 | MIC VR1 | O | MIC volume signal 1. |
| | 4 | GND | - | GND. |
| | 5 | TXB | O | Transmission power supply (8V). |
| | 6 | CV | I | Carrier volume voltage. |
| CN5 | 1 | 14VAF | I | AF PA power supply (14V). |
| | 2 | 14V | I | 14V. |
| | 3 | 8V | I | 8V. |
| | 4 | TXB | O | Transmission power supply (8V). |
| | 5 | 50B | O | 50MHz band power supply. 8V when 40.5~60MHz |
| | 6 | HFHG | I | HF final decision voltage. Relay |
| | 7 | 50HG | I | 50MHz final decision voltage. Relay |
| | 8 | PT | I | Protection signal. |
| | 9 | GND | - | GND. |
| CN6 | 1 | SS | I | Standby switch. "L" : TX |
| | 2 | 8M | O | MIC power supply (8V) |

| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|---------------|--------------|---------------|-----|---|
| | 3 | GND | - | GND. |
| | 4 | MIC | I | MIC signal. |
| | 5 | MG | - | MIC GND. |
| CN7 | 1 | FDA | I | IF serial data. |
| | 2 | FCK | I | IF serial clock. |
| | 3 | FLE1 | I | IF serial enable 1. |
| | 4 | FLE2 | I | IF serial enable 2. |
| | 5 | TOB | I | Tone unit control voltage. |
| | 6 | LIN | I | Linear standby relay control signal. "H" : Active |
| | 7 | ABK | I | AF blanking signal. "H" : Active |
| | 8 | TXI | I | Transmission band data. "L" : Active |
| | 9 | CSS | O | Standby for microprocessor. "L" : TX |
| | 10 | SS | I | Standby switch. "L" : TX |
| | 11 | TXB | O | ON AIR LED (8V when lights). |
| | 12 | 50HG | O | 50MHz final decision voltage. Relay |
| | 13 | HFHG | O | HF final decision voltage. Relay |
| | 14 | RFM | O | Power meter signal. |
| | 15 | ALDB | O | Volume meter signal, ALC meter signal. |
| | 16 | REV | O | Reflected wave meter signal. |
| | 17 | SM | O | S-meter signal. |
| | 18 | DBC | O | DSP connection voltage. "L" : Install |
| | 19 | NC | - | |
| | 20 | GND | - | GND. |
| CN8 | 1 | PC1 | O | Power control volume voltage 1. |
| | 2 | PC2 | I | Power control volume voltage 2. |
| | 3 | GND | - | GND. |
| | 4 | VSR | I | Reflected wave voltage. |
| CN9 | 1 | DVR1 | O | Delay volume voltage 1. |
| | 2 | DVR2 | I | Delay volume voltage 2. |
| CN10 | 1 | RTK | O | RTTY keying signal. |
| | 2 | 10K | I | DSP reference frequency. |
| | 3 | 10G | - | DSP reference frequency GND. |
| | 4 | GND | - | GND. |
| | 5 | RFG1 | O | RF GAIN volume voltage 1. |
| | 6 | RFG2 | I | RF GAIN volume voltage 2. |
| CN11 | 1 | AV2 | I | AF volume signal 2. |
| | 2 | GND | - | GND. |
| | 3 | BZ | I | Buzzer signal. |
| | 4 | NC | - | |
| CN12 | 1 | SP | O | Speaker signal. |
| | 2 | GND | - | GND. |
| CN13 | 1 | SPK | O | Phone jack speaker signal. |
| | 2 | PH2 | I | Phone jack speaker signal. (Off when phone install) |
| | 3 | PH3 | - | Phone jack GND. |
| CN14 | 1 | VO | I | VS-2 voice signal. |
| | 2 | GND | - | GND. |
| CN15 | 1 | AV1 | O | AF volume signal 1. |
| | 2 | GND | - | GND. |
| CN16 | 1 | NTR | O | Notch volume voltage. |
| | 2 | NTG | I | Notch volume GND. |
| | 3 | FM SQ1 | O | Squelch volume voltage 1 (FM). |
| | 4 | FM SQ2 | I | Squelch volume voltage 2 (FM). |
| | 5 | NFM SQ1 | O | Squelch volume voltage 1 (except FM). |
| | 6 | NFM SQ2 | I | Squelch volume voltage 2 (except FM). |
| W1 | 1 | GND | - | GND. |
| | 2 | RIF | I | Receive IF signal (455kHz). |
| | 3 | GND | - | GND. |
| | 4 | TIF | O | Transmission IF signal (455kHz). |
| W3 | 1 | TOB | O | Tone unit control voltage. |

| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|---------------------------|--------------|---------------|-----|-------------------------------|
| | 2 | TON | I | Sub tone signal. |
| | 3 | GND | - | GND. |
| PLL UNIT (X50-3150-XX) | | | | |
| CN1 | 1 | 10K | O | DSP reference frequency. |
| | 2 | 10G | - | DSP reference frequency GND. |
| CN2 | 1 | VB0 | I | VCO band data 0. |
| | 2 | VB1 | I | VCO band data 1. |
| | 3 | VB2 | I | VCO band data 2. |
| | 4 | VB3 | I | VCO band data 3. |
| | 5 | PLE1 | I | PLL enable 1. |
| | 6 | PCK | I | PLL clock. |
| | 7 | PLE2 | I | PLL enable 2. |
| | 8 | PDA | I | PLL data. |
| | 9 | BCH | I | PLL band-pass select. |
| | 10 | UL | O | PLL unlock data. "L" : Unlock |
| | 11 | 14V | I | 14V. |
| | 12 | GND | - | GND. |
| CN3 | Coaxial | LO1 | O | Local 1 signal (VCO). |
| CN4 | Coaxial | LO2 | O | Local 2 signal (64.22MHz). |
| CN5 | 1 | FMM | I | FM modulation signal. |
| | 2 | GND | - | GND. |
| CN6 | Coaxial | 20M | O | 20MHz reference frequency. |
| CN7 | Coaxial | DLO | I | DDS local signal. |
| CN8 | 1 | 8V | I | 8V. |
| | 2 | 5V | I | 5V. |
| | 3 | GND | - | GND. |
| CAR UNIT (X50-3160-00) | | | | |
| CN1 | 1 | CAR | O | CAR signal (455kHz). |
| | 2 | GND | - | GND. |
| | 3 | RTK | I | RTTY keying signal. |
| | 4 | GND | - | GND. |
| CN2 | Coaxial | 20M | I | 20MHz reference frequency. |
| CN3 | 1 | LO3 | O | Local 3 signal (8.375MHz). |
| | 2 | GND | - | GND. |
| CN4 | Coaxial | DLO | O | DDS local signal. |
| CN5 | 1 | 8V | O | 8V. |
| | 2 | 5V | O | 5V. |
| | 3 | GND | - | GND. |
| | 4 | NC | - | |
| CN6 | 1 | 8V | I | 8V. |
| | 2 | 5V | I | 5V. |
| | 3 | GND | - | GND. |
| CN7 | 1 | CDA | I | CAR DDS data. |
| | 2 | CCK | I | CAR DDS clock. |
| | 3 | CLE1 | I | CAR DDS enable 1. |
| | 4 | ABSL | I | DDS channel A/B select. |
| | 5 | CLE2 | I | CAR DDS enable 2. |
| | 6 | CASL | I | DDS channel A/B select. |
| | 7 | NC | - | |
| | 8 | GND | - | GND. |
| FILTER UNIT (X51-3110-XX) | | | | |
| CN1 | Coaxial | HFPO | I | HF final signal. |
| CN2 | Coaxial | 50MPO | I | 50MHz final signal. |
| CN3 | Coaxial | AT1 | O | AT signal 1. |
| CN4 | Coaxial | AT2 | I | AT signal 2. |
| CN5 | 1 | RAT | O | receive antenna signal. |
| | 2 | GND | - | GND. |

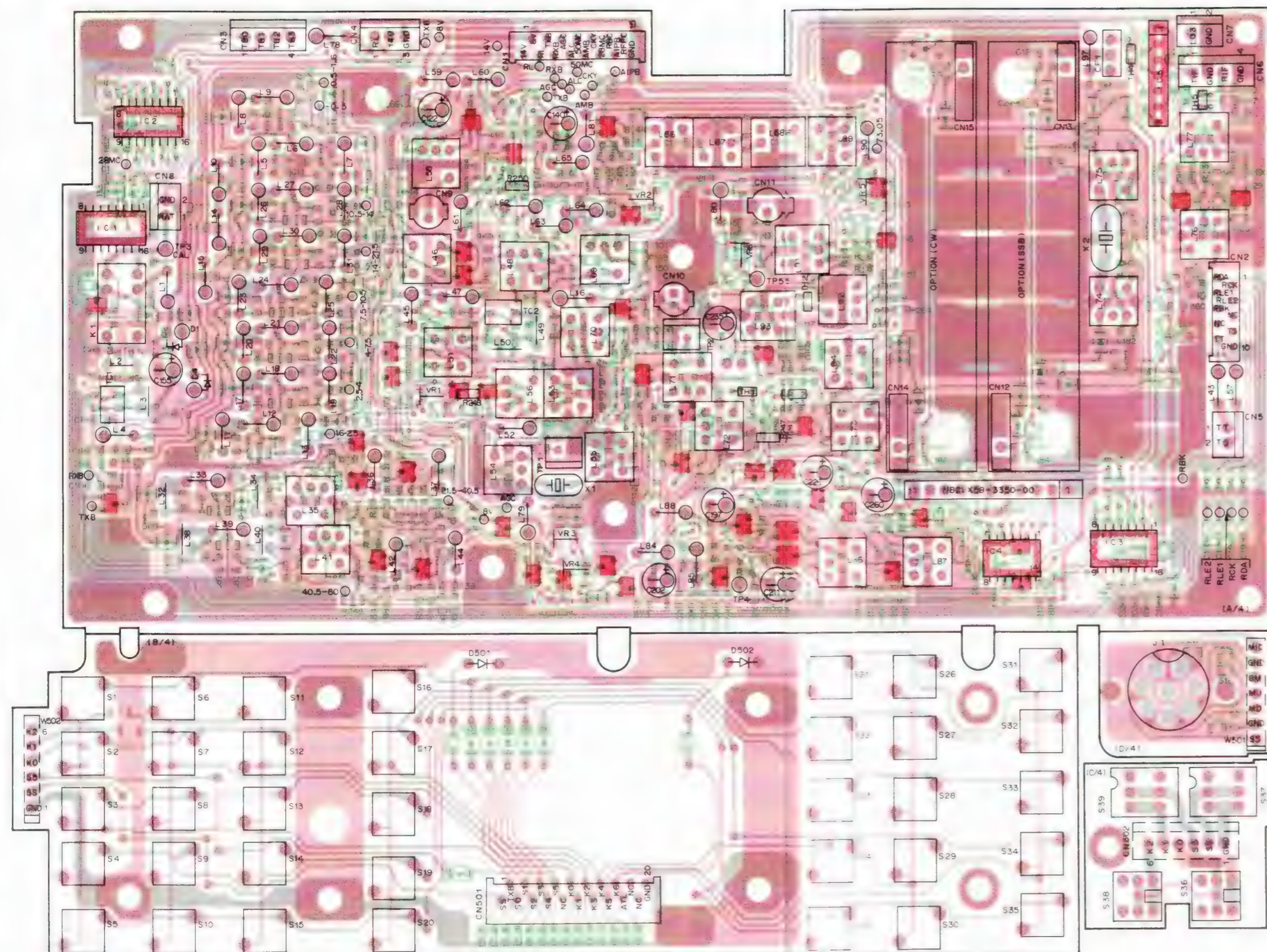
TERMINAL FUNCTION

| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|------------------------------|--------------|---------------|-----|---|
| CN6 | 1 | 14V | I | 14V. |
| | 2 | TB0 | I | Transmission LPF select data. "L" : Active |
| | 3 | TB1 | I | Transmission LPF select data. "L" : Active |
| | 4 | TB2 | I | Transmission LPF select data. "L" : Active |
| | 5 | TB3 | I | Transmission LPF select data. "L" : Active |
| | 6 | RL | I | Relay power supply (14V). |
| | 7 | GND | - | GND. |
| CN7 | 1 | TS | I/O | AT-300 control signal. |
| | 2 | TT | I/O | AT-300 control signal. |
| CN8 | 1 | VSR | O | Reflected wave voltage. |
| | 2 | GND | - | GND. |
| | 3 | GND | - | GND. |
| | 4 | VSF | O | Forward wave voltage. |
| CN9 | 1 | 28A | O | AT band data. 25~30MHz |
| | 2 | 14A | O | AT band data. 10.5~14.5MHz |
| | 3 | 25A | O | AT band data. 21.5~25MHz |
| | 4 | 21A | O | AT band data. 14.5~21.5MHz |
| | 5 | 7A | O | AT band data. 4~7.5MHz |
| | 6 | 10A | O | AT band data. 7.5~10.5MHz |
| | 7 | GND | - | GND. |
| W1 | | ANT1 | O | ANT1. |
| W2 | | ANT2 | O | ANT2. Only 50MHz when S1 changeover. (TS-690S only) |
| W3 | | 14S | I | AT-300 power supply (14V). |
| W4 | 1 | GND | - | GND. |
| | 2 | TT | I/O | AT-300 control signal. |
| | 3 | GND | - | GND. |
| | 4 | NC | - | |
| | 5 | TS | I/O | AT-300 control signal. |
| | 6 | 14S | O | AT-300 power supply (14V). |
| W7 | | GND | - | ANT1 GND. |
| W8 | | GND | - | ANT2 GND. |
| AT UNIT (X53-3370-00) | | | | |
| CN1 | Coaxial | ATD1 | I | AT variable condenser 1. |
| CN2 | Coaxial | ATD2 | O | AT variable condenser 2. |
| CN3 | 1 | POD1 | O | Variable condenser position detection signal 1. Relay |
| | 2 | POD2 | O | Variable condenser position detection signal 2. Relay |
| | 3 | VREF | I | AT reference voltage (5V). Relay |
| | 4 | ATG | - | AT GND. |
| | 5 | PR22 | I | Motor rotate direction control 4. |
| | 6 | PR21 | I | Motor rotate direction control 3. |
| | 7 | PR12 | I | Motor rotate direction control 2. |

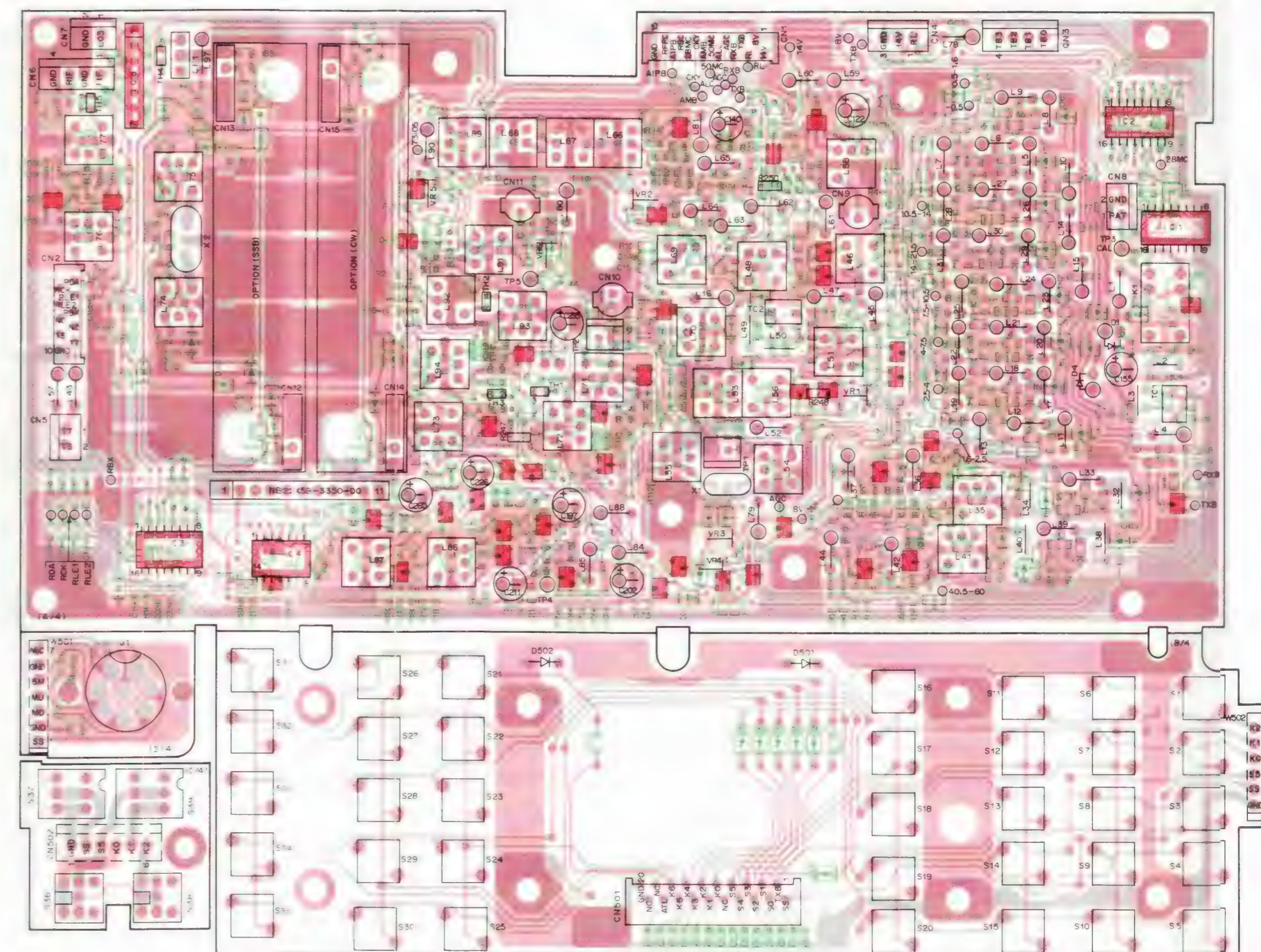
| Connector No. | Terminal No. | Terminal Name | I/O | Terminal Function |
|---------------|--------------|---------------|-----|--|
| | 8 | PR11 | I | Motor rotate direction control 1. |
| | 9 | ATA | I | AUTO/THRU switch. |
| | 10 | APRE | I | "H" : AUTO, "L" : THRU |
| | | | | Preset control select. |
| | 11 | SPED | I | "H" : Auto, "L" : Preset |
| | | | | Motor speed control. "H" : Go, "L" : Stop |
| | 12 | AT1 | O | Preset AT install. "L" : Install |
| | 13 | 14V | I | 14V. |
| | 14 | 5V | I | 5V. |
| | 15 | GND | - | GND. |
| | 16 | GND | - | GND. |
| CN4 | 1 | M2- | O | Motor drive 2 -. |
| | 2 | M2+ | O | Motor drive 2 +. |
| | 3 | M1+ | O | Motor drive 1 +. |
| | 4 | M1- | O | Motor drive 1 -. |
| | 5 | POD2 | I | Variable condenser position detection 2. Relay |
| | 6 | VREF | O | AT reference voltage (5V). Relay |
| | 7 | POD1 | I | Variable condenser position detection 1. Relay |
| | 8 | GND | - | GND. |
| W1 | Coaxial | AT1 | I | AT signal 1. |
| W2 | Coaxial | AT2 | O | AT signal 2. |
| W101 | Coaxial | ATD1 | O | AT variable condenser 1. |
| W102 | Coaxial | ATD2 | I | AT variable condenser 2. |
| W103 | 1 | 28A | I | AT band data. 25~30MHz |
| | 2 | 25A | I | AT band data. 21.5~25MHz |
| | 3 | 21A | I | AT band data. 14.5~21.5MHz |
| | 4 | 14A | I | AT band data. 10.5~14.5MHz |
| | 5 | 10A | I | AT band data. 7.5~10.5MHz |
| | 6 | 7A | I | AT band data. 4~7.5MHz |
| | 7 | GND | - | GND. |
| W104 | 1 | GND | - | GND. |
| | 2 | POD1 | O | Variable condenser position detection 1. |
| | 3 | VREF | I | AT reference voltage (5V). |
| | 4 | POD2 | O | Variable condenser position detection 2. |
| W105 | 1 | M2+ | I | Motor drive 2 +. |
| | 2 | M2- | I | Motor drive 2 -. |
| W106 | 1 | M1- | I | Motor drive 1 -. |
| | 2 | NC | - | |
| | 3 | M1+ | I | Motor drive 1 +. |

TS-450S/690S PC BOARD VIEWS

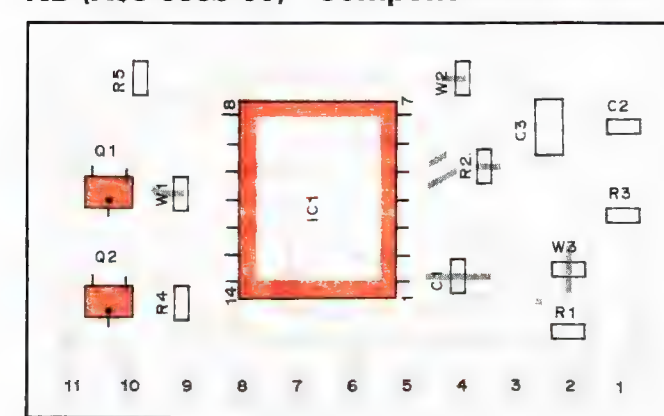
RF UNIT (X44-3130-XX) -00 : TS-690S -01 : TS-450S Component side view



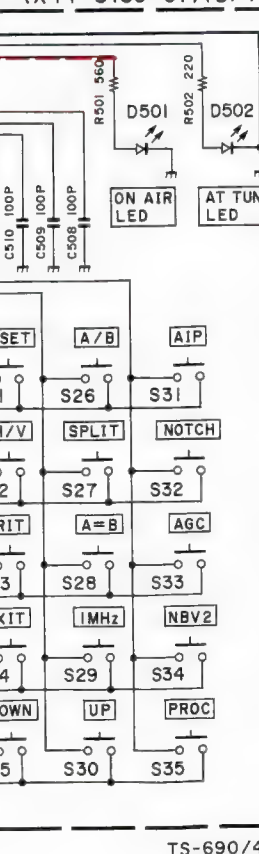
RF UNIT (X44-3130-XX) -00 : TS-690S -01 : TS-450S Foil side view



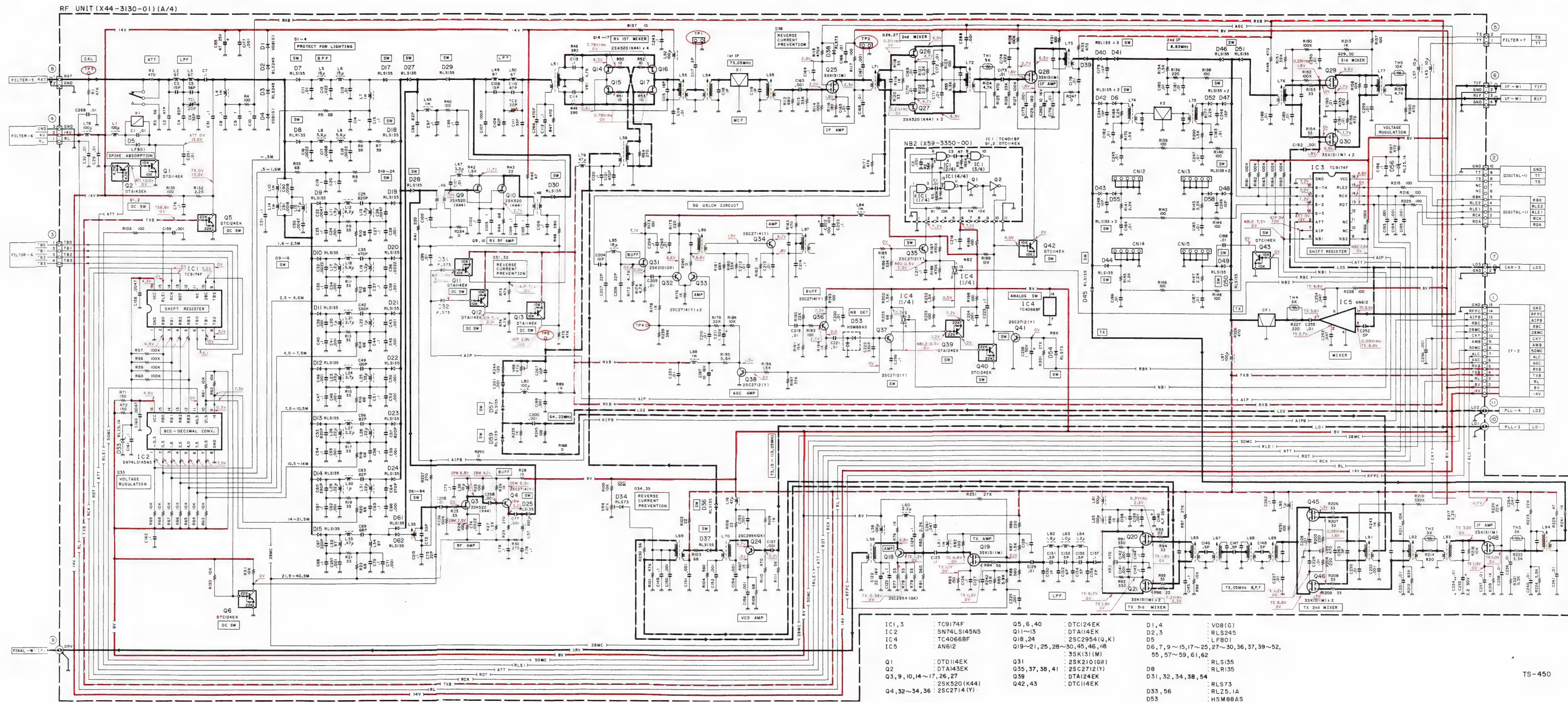
NB (X59-3350-00) Component side view



RF UNIT (X44-3130-01) (B/4)



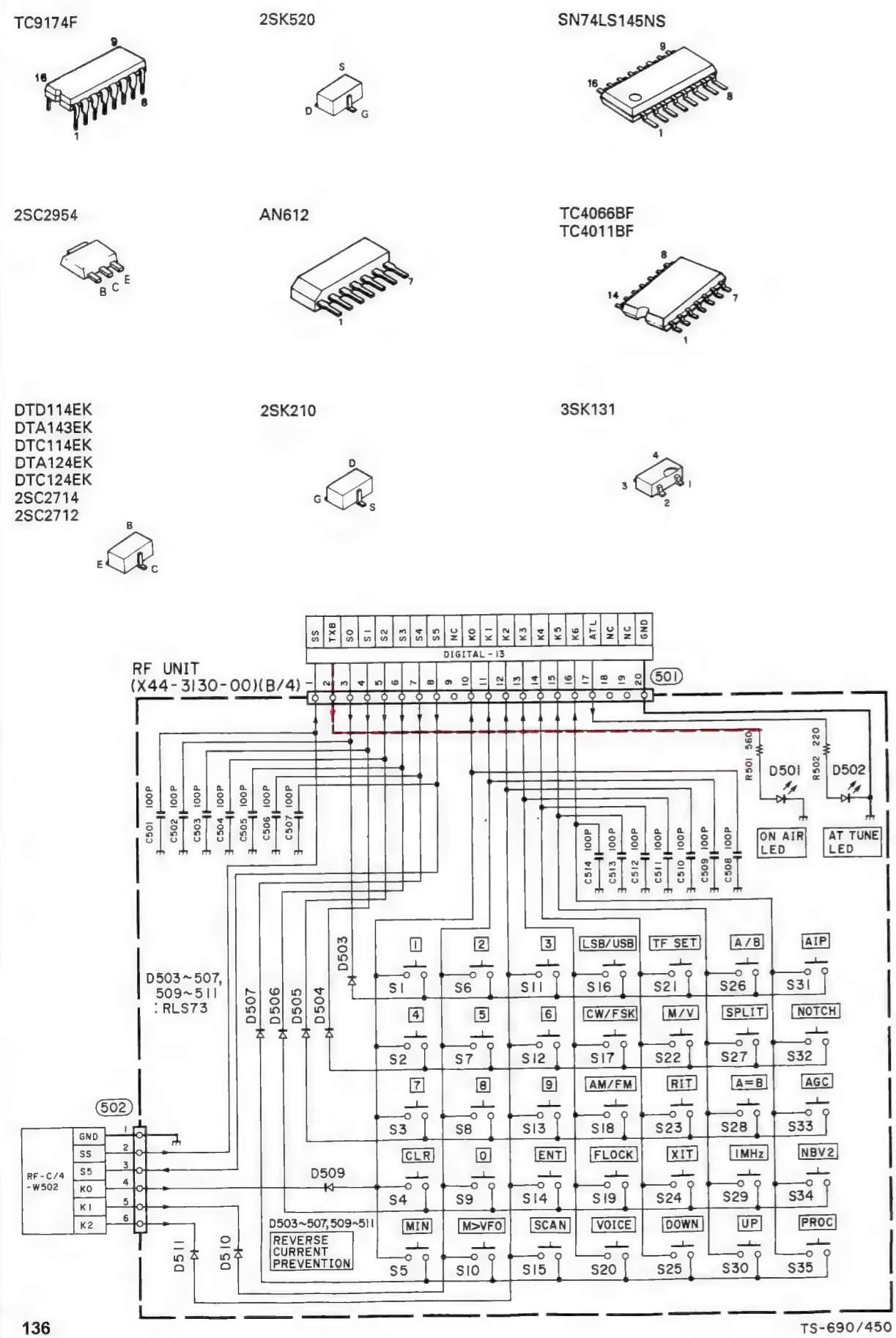
TS-690/450



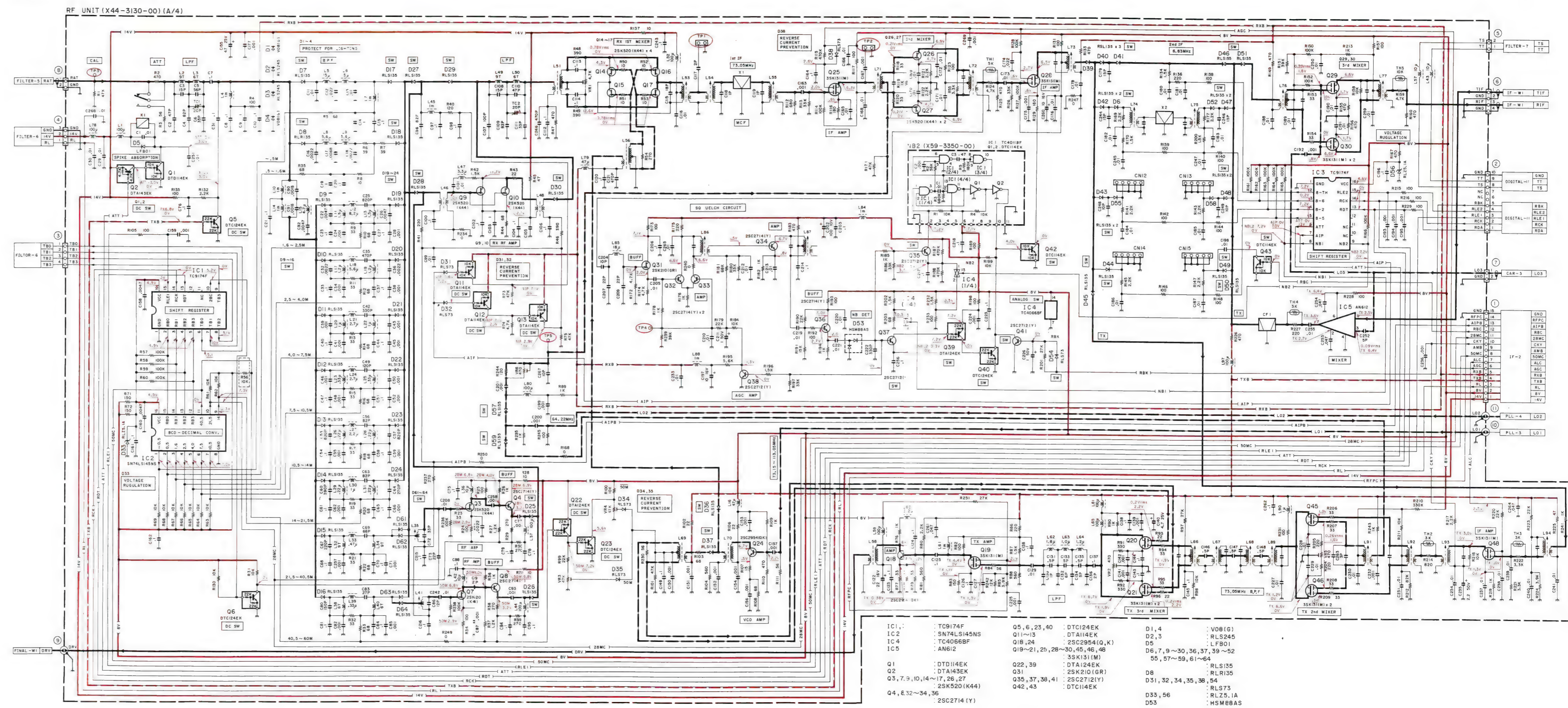
- | | | | | | |
|--------------------------|-------------|-------------------------------|--------------|---|----------|
| IC1, 3 | TC9174F | Q5, 6, 40 | DTIC24EK | D1, 4 | V08(G) |
| IC2 | SN74LS145NS | Q11~13 | DTA114EK | D2, 3 | RLS245 |
| IC4 | TC4066BF | Q18, 24 | 2SC2954(Q,K) | D5 | LF801 |
| IC5 | AN612 | Q19~21, 25, 28~30, 45, 46, 48 | 3SK131(M) | D6, 7, 9~15, 17~25, 27~30, 36, 37, 39~52, 55, 57~59, 61, 62 | |
| Q1 | DTD114EK | Q31 | 2SK210(IG) | D8 | RLR135 |
| Q2 | DTA143EK | Q35, 37, 38, 41 | 2SC2712(Y) | D31, 32, 34, 38, 54 | |
| Q3, 9, 10, 14~17, 26, 27 | 2SK520(K44) | Q39 | DTA124EK | | RLS73 |
| Q4, 32~34, 36 | 2SC2714(Y) | Q42, 43 | DTIC14EK | D33, 56 | RLZ5, 1A |
| | | | | D53 | HSM88AS |

TS-450

TS-690S CIRCUIT DIAGRAM

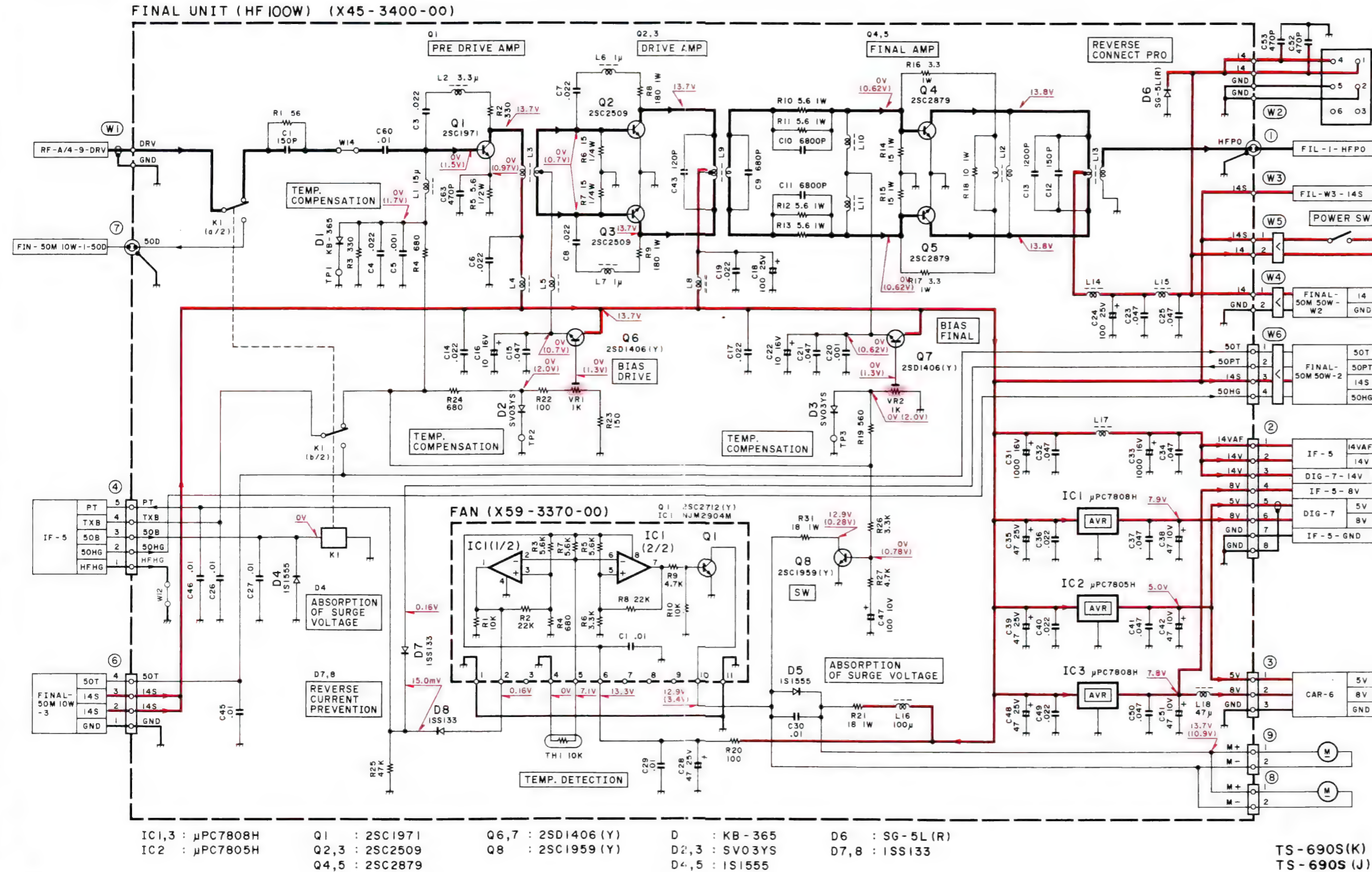


RF UNIT (X44-3130-00) : TS-690S



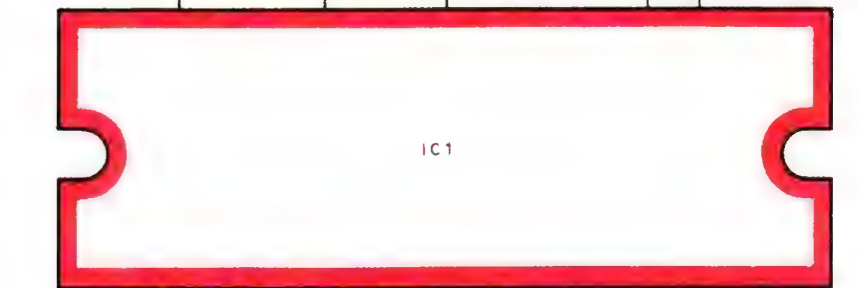
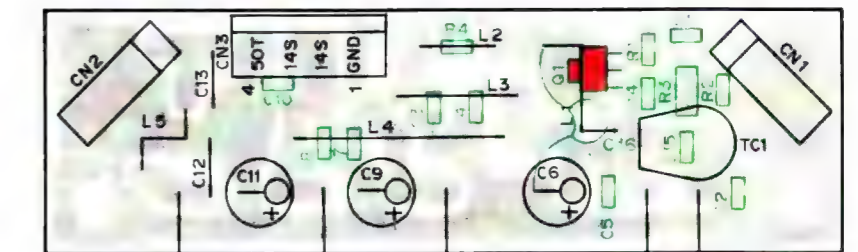
TS-690S CIRCUIT DIAGRAM / PC BOARD VIEWS

HF 100W FINAL UNIT (X45-3400-00) : TS-690S



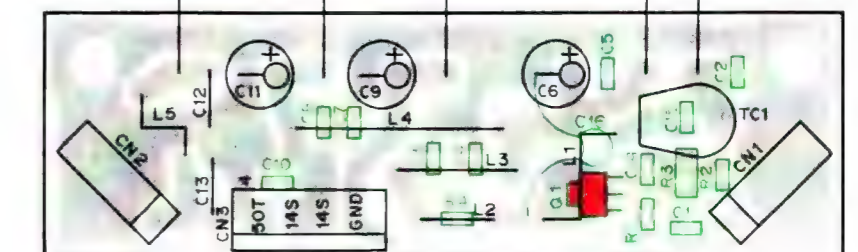
50MHz 10W FINAL UNIT (X45-3420-00)

Component side view : TS-690S



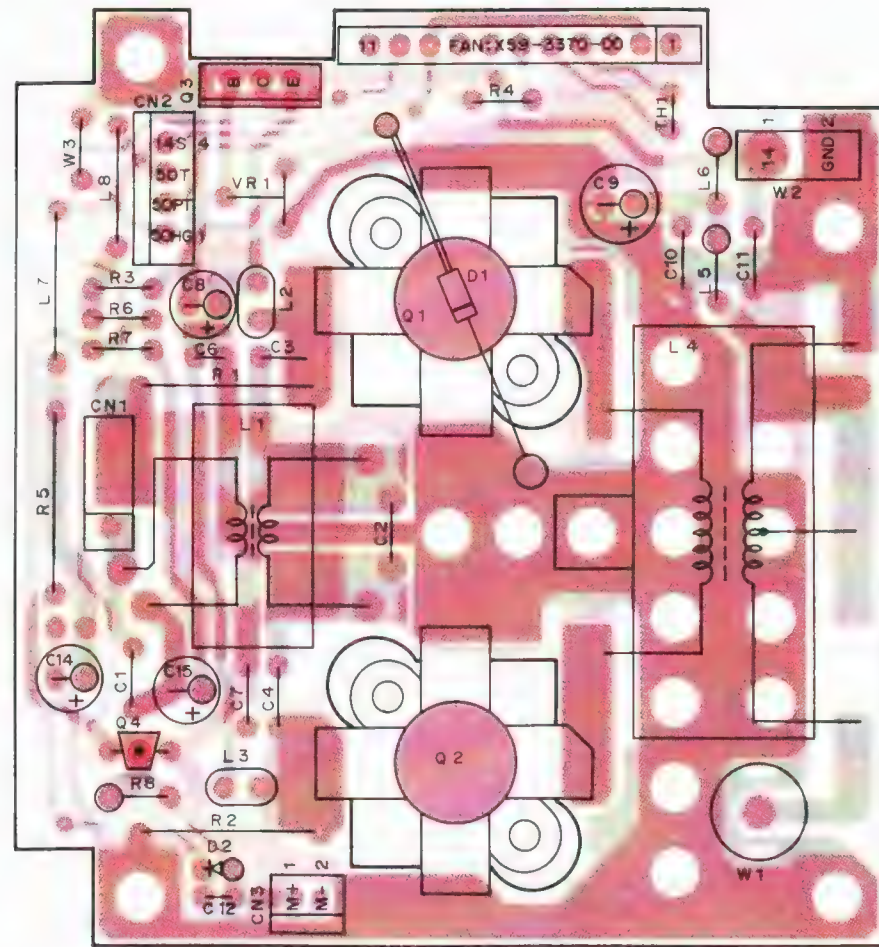
50MHz 10W FINAL UNIT (X45-3420-00)

Foil side view : TS-690S

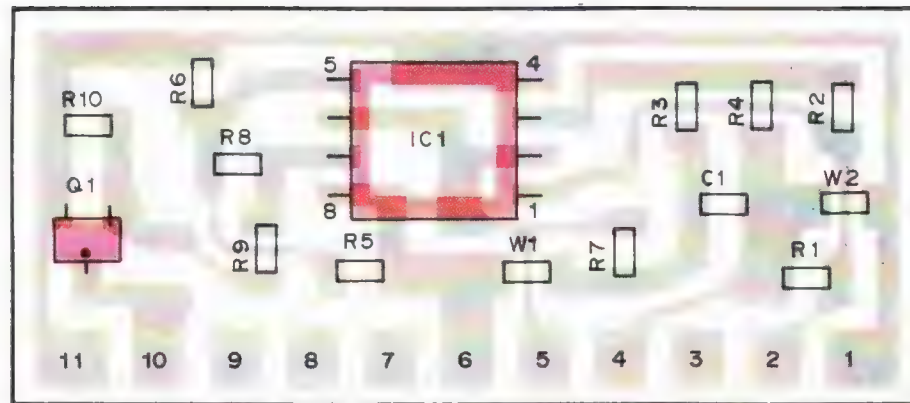


CIRCUIT DIAGRAM / PC BOARD VIEWS TS-690S

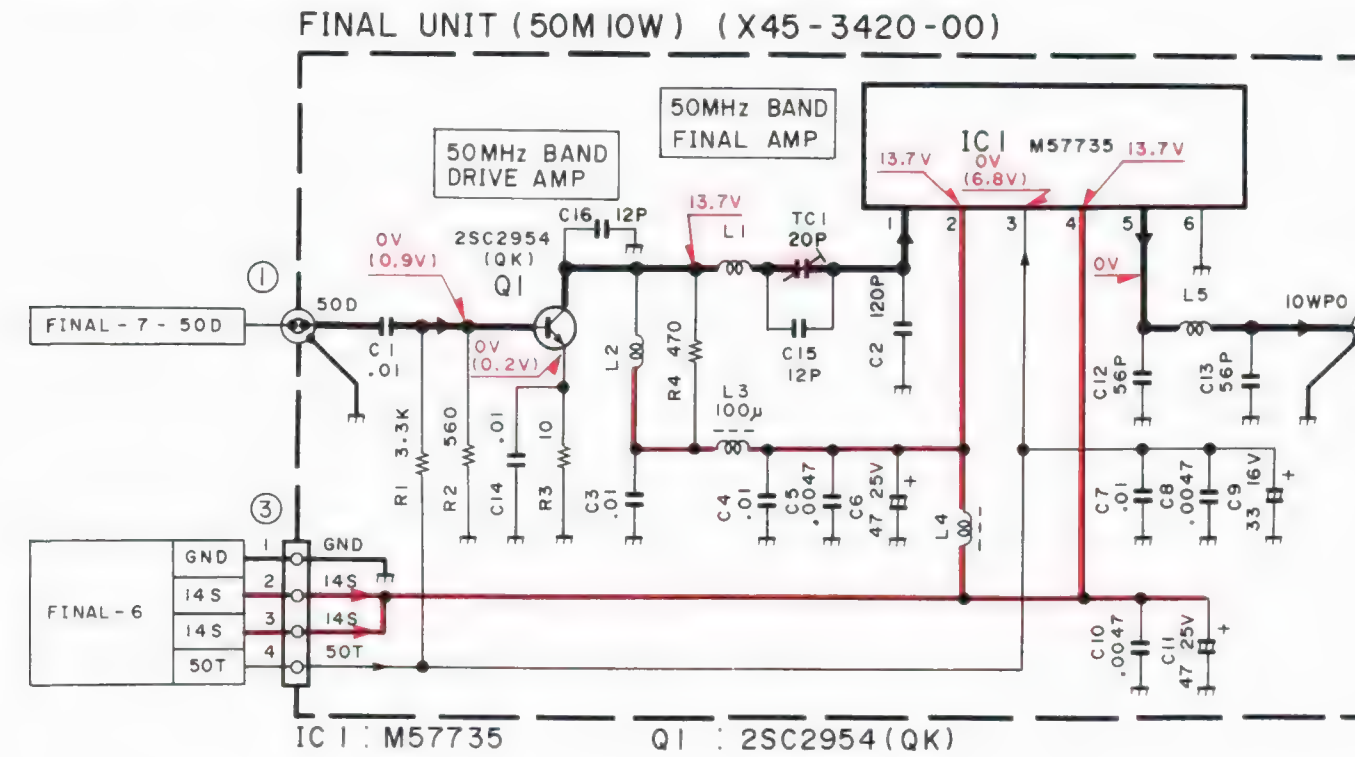
50MHz 50W FINAL UNIT (X45-3430-00)
Component side view : TS-690S



FAN (X59-3370-00) Component side view



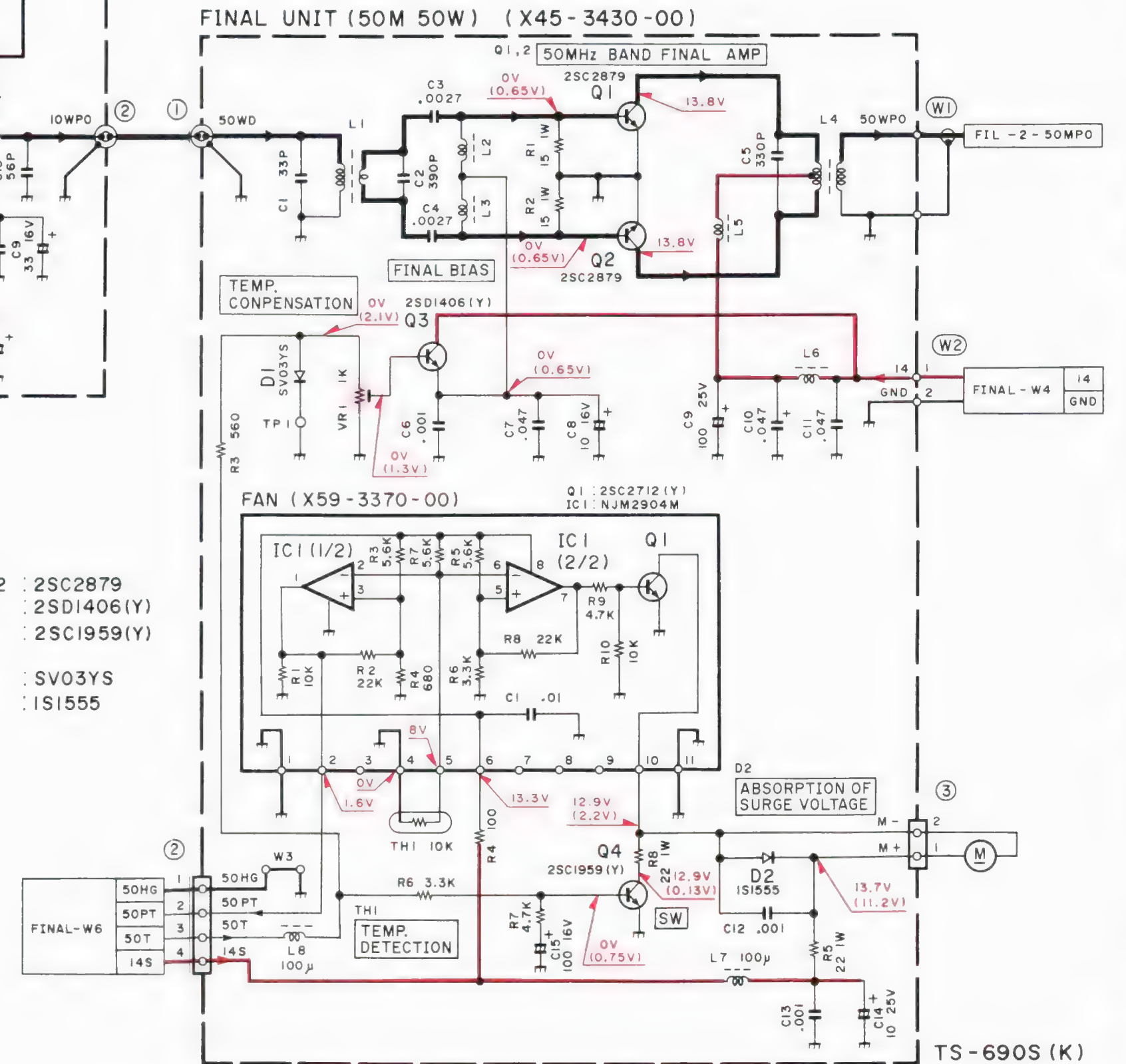
50MHz 10W FINAL UNIT (X45-3420-00) : TS-690S



Q1,2 : 2SC2879
Q3 : 2SD1406(Y)
Q4 : 2SC1959(Y)

D1 : SV03YS
D2 : IS1555

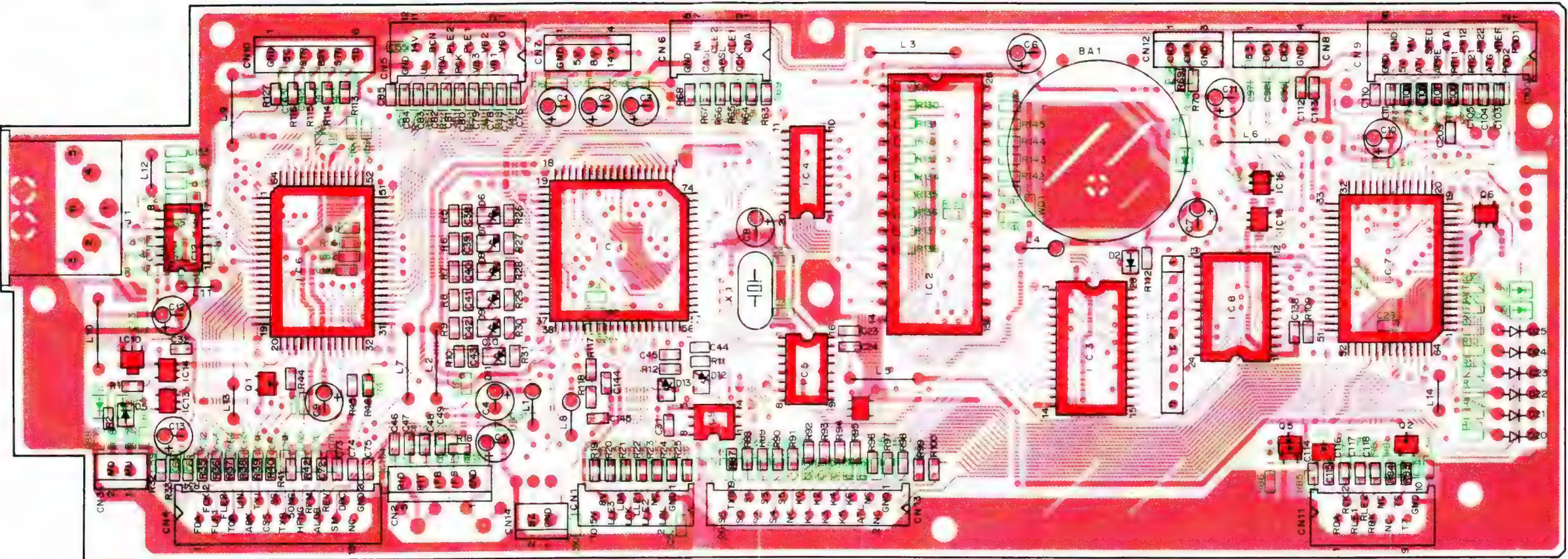
50MHz 50W FINAL UNIT (X45-3430-00) : TS-690S



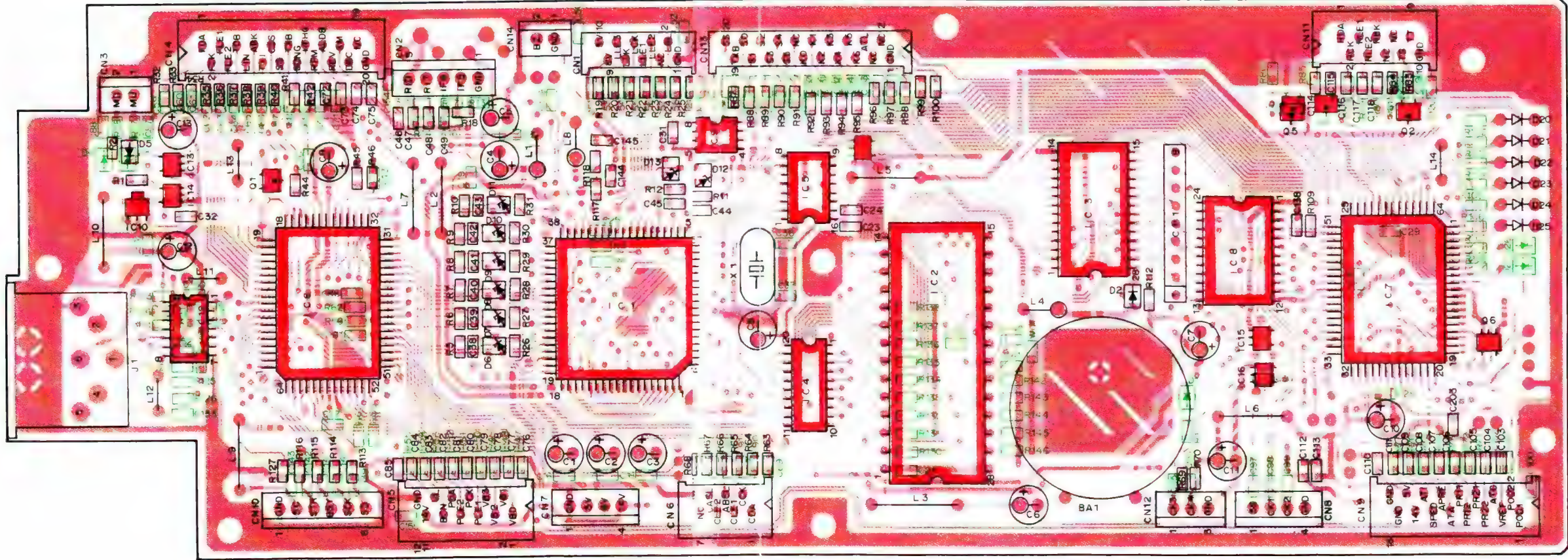
TS-690S (K)

TS-450S/690S PC BOARD VIEWS

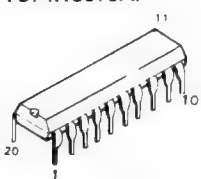
DIGITAL UNIT (X46-312X-XX) Component side view
0-11 : TS-690S (K,P) 0-12 : TS-450S (K,P) 0-21 : TS-690S (X,M) 0-22 : TS-450S (X,M)
0-23 : TS-450S (M2) 2-71 : TS-690S (E) 2-72 : TS-450S (E) 2-73 : TS-690S (E2) 2-74 : TS-450S (E2)



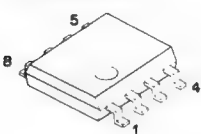
DIGITAL UNIT (X46-312X-XX) Foil side view
0-11 : TS-690S (K,P) 0-12 : TS-450S (K,P) 0-21 : TS-690S (X,M) 0-22 : TS-450S (X,M)
0-23 : TS-450S (M2) 2-71 : TS-690S (E) 2-72 : TS-450S (E) 2-73 : TS-690S (E2) 2-74 : TS-450S (E2)



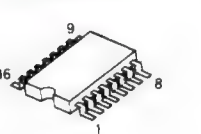
TC74HC573AF



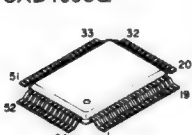
CAT35C104KI



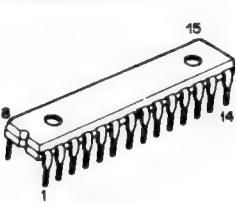
TC74HC138AF



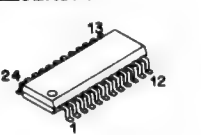
CXD1095Q



LC3564PML-12



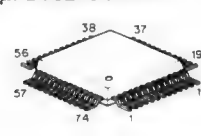
LZ92K371



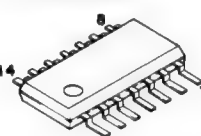
M51951BML



μPD78213GJ-5BJ



SN74AS04NS



DTC124EK
DTC143EK



TC4S584F
TC7S08F



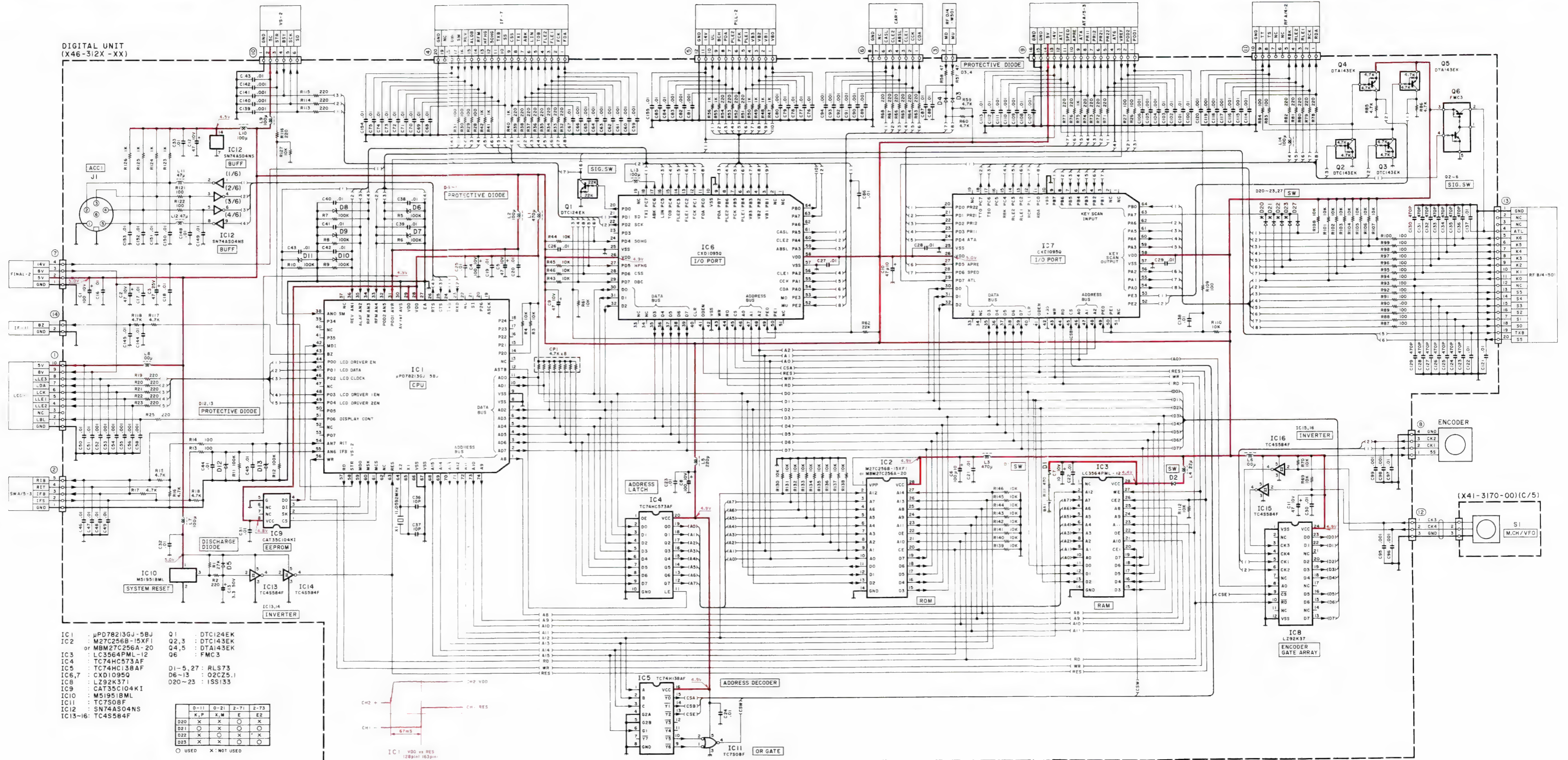
FMC3





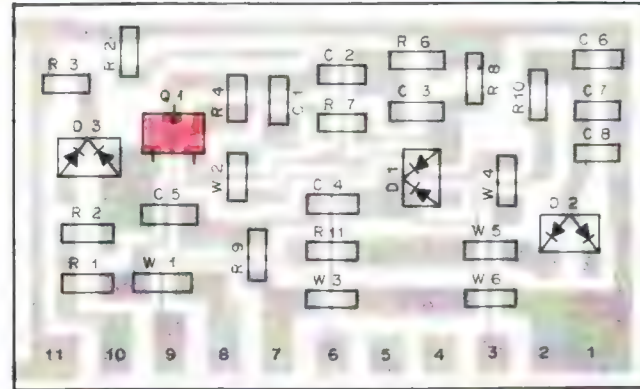
TS-690S CIRCUIT DIAGRAM

DIGITAL UNIT (X46-312X-XX) : TS-690S
0-11 : TS-690S (K,P) 0-21 : TS-690S (X,M) 2-71 : TS-690S (E) 2-73 : TS-690S (E2)

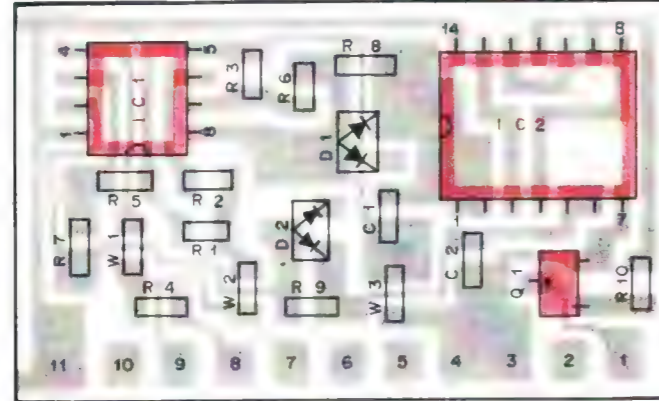


PC BOARD VIEWS TS-450S/690S

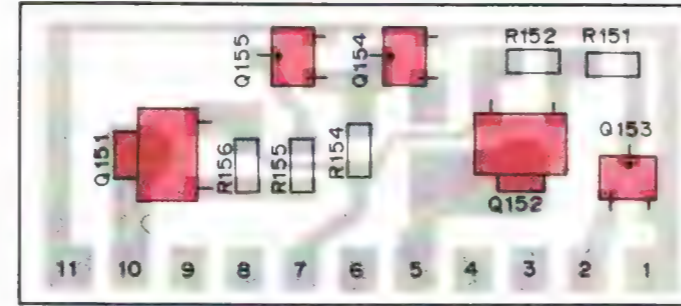
SIDE TONE (X59-1060-00)
Component side view



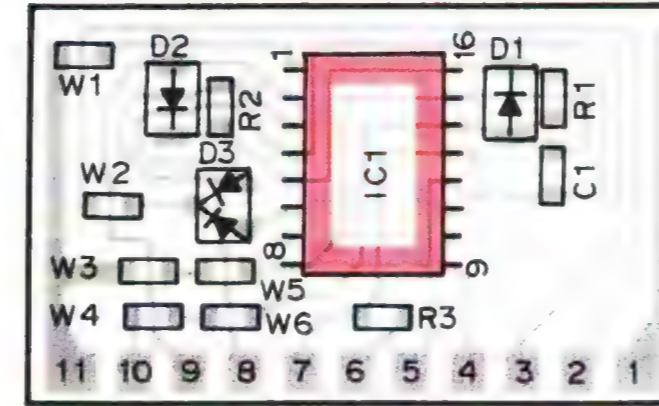
VOX (X59-1080-00)
Component side view



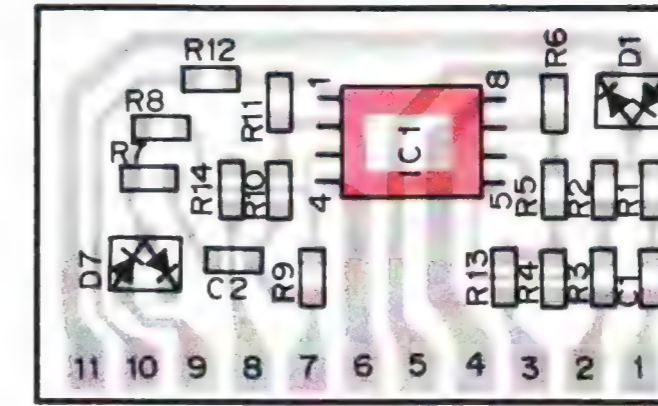
TRX (X59-3680-01)
Component side view



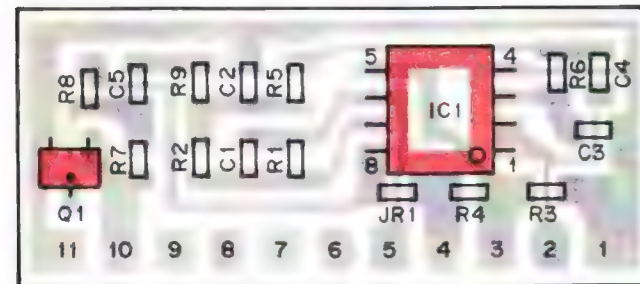
DELAY (X59-3860-00)
Component side view



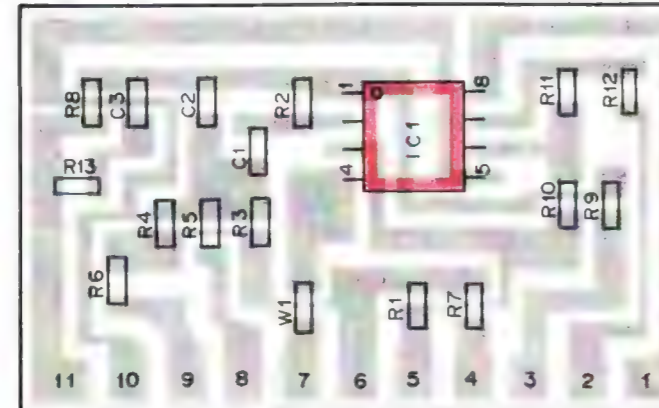
METER (X59-3940-00)
Component side view



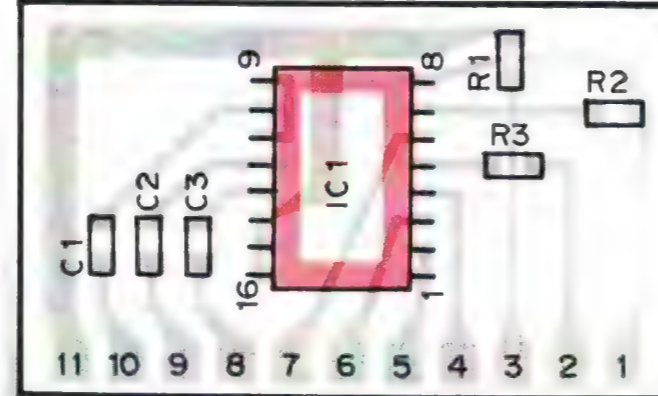
FM MIC (X59-3000-03)
Component side view



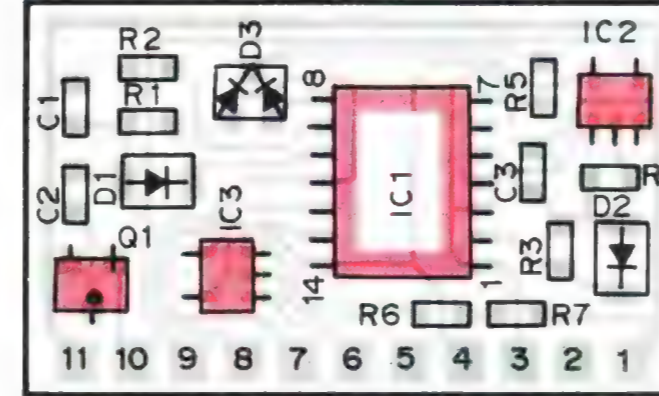
NOTCH (X59-3030-00)
Component side view



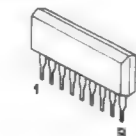
SELECT (X59-3920-00)
Component side view



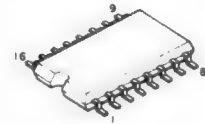
BK-IN (X59-3930-00)
Component side view



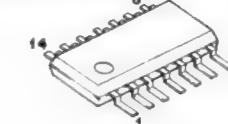
μPC1313HA



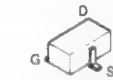
TC4053BF



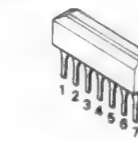
NJM2902M



2SK210



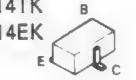
μPC1037HA



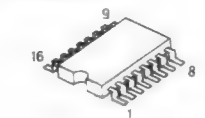
μPC2002V



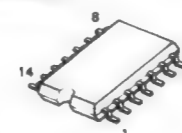
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2SC2712
2SC3722K
2SD1757K
DTA114EK
DTA124EK
DTA143EK
DTB123EK
DTC114EK
DTC124EK
DTC114TK
DTD114EK



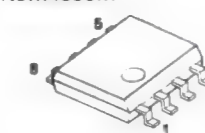
TC4538BF



TC4001BF
TC4066BF
TC4069UBF



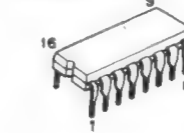
NJM2904M
NJM4558M



IMH5



TC9174F



AN612



3SK131



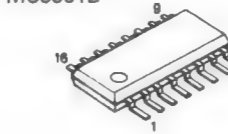
FMA5
FMC2
FMC3



2SA1213



MC3361D

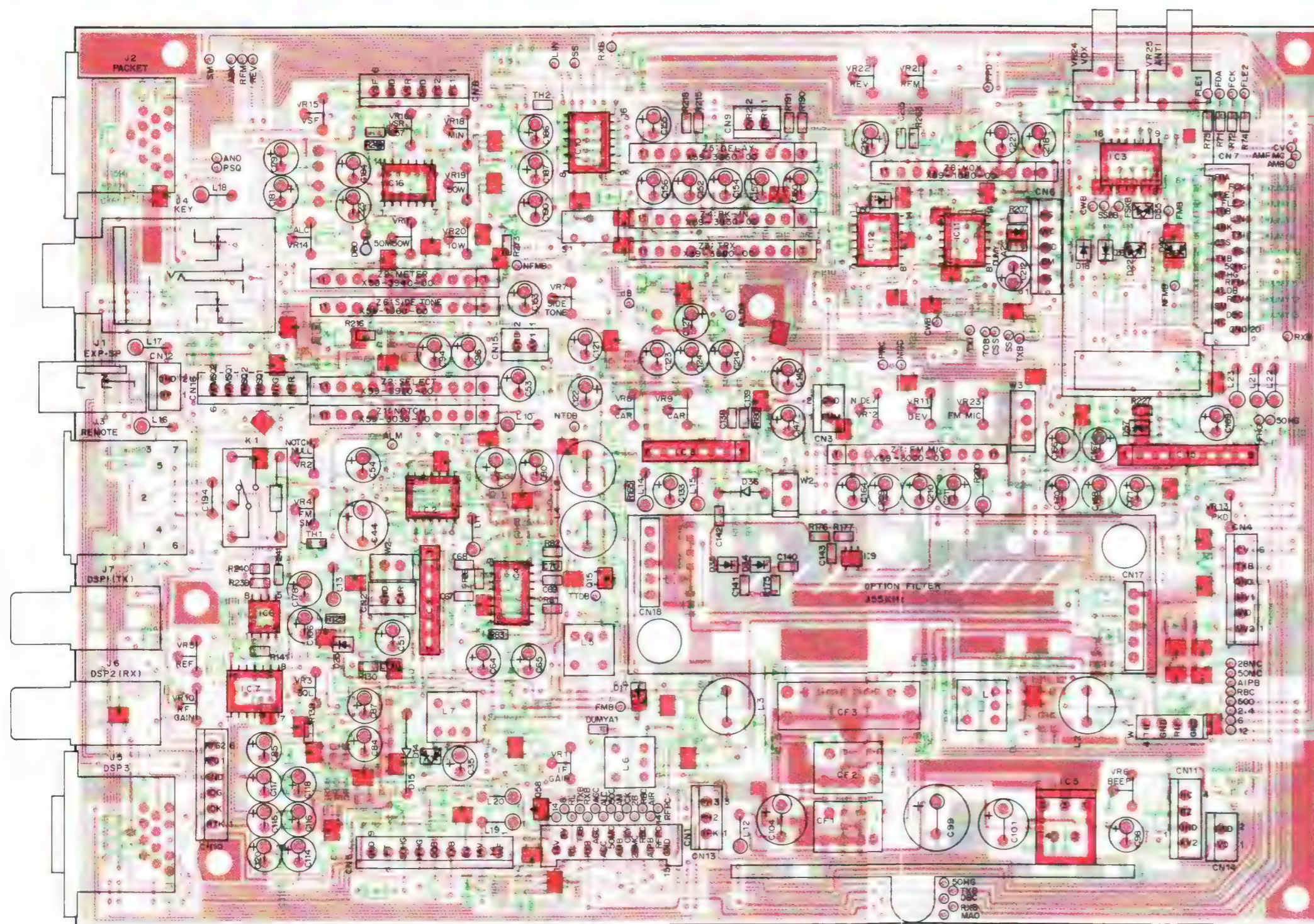


TC4S11F
TC4S66F

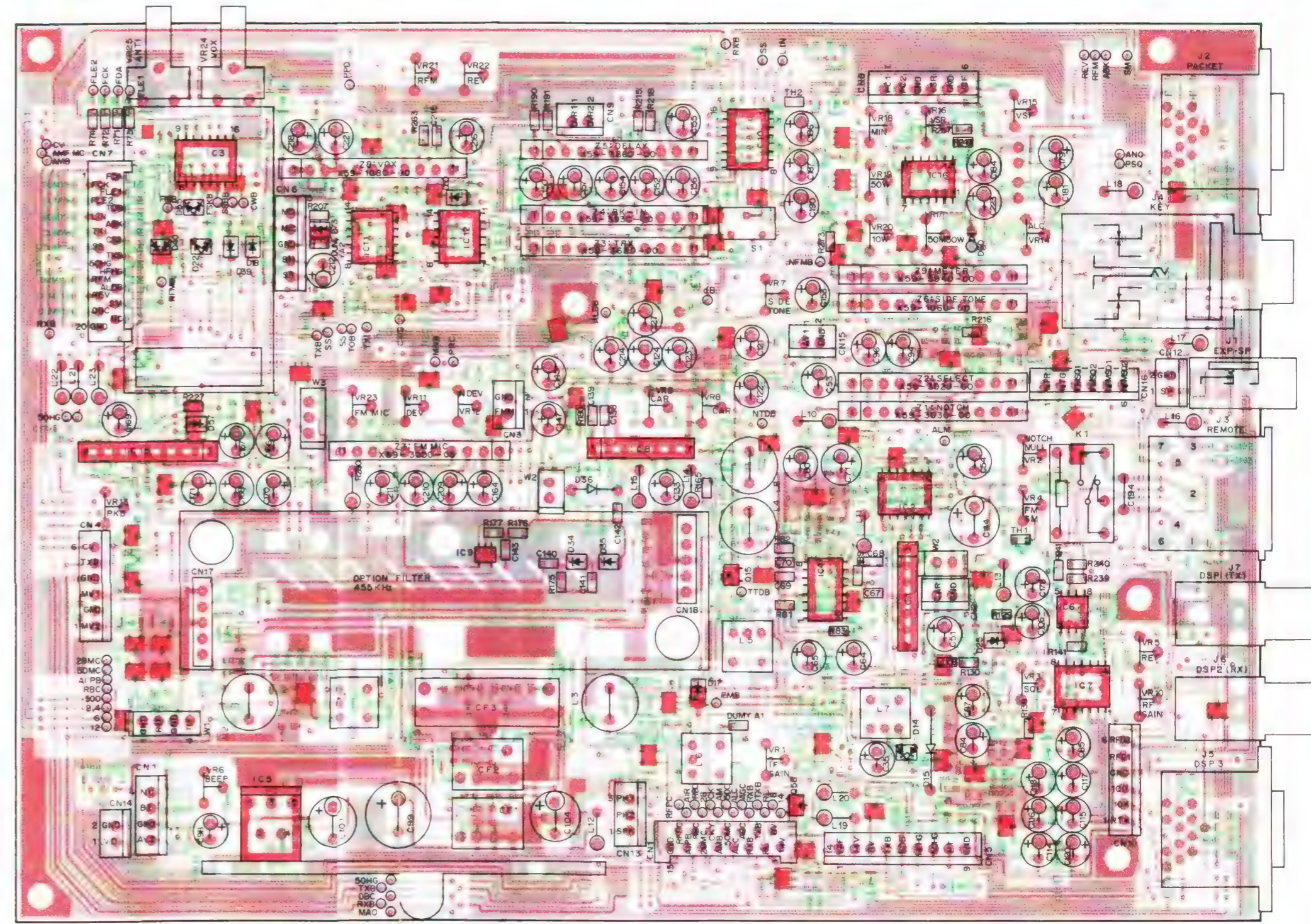


TS-450S/690S PC BOARD VIEWS

IF UNIT (X48-3090-XX) Component side view -00 : TS-690S -01 : TS-450S



IF UNIT (X48-3090-XX) Foil side view -00 : TS-690S -01 : TS-450S

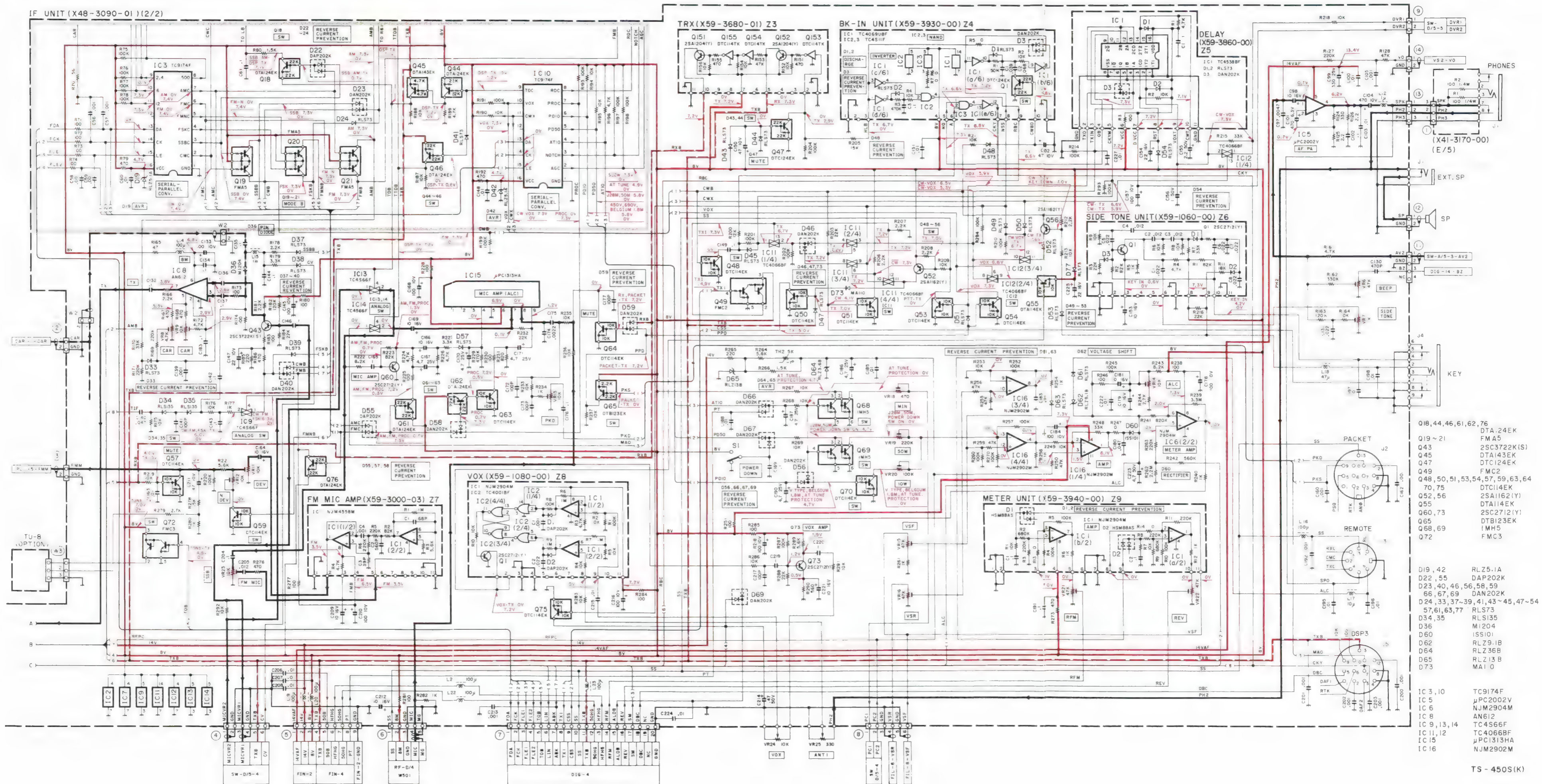


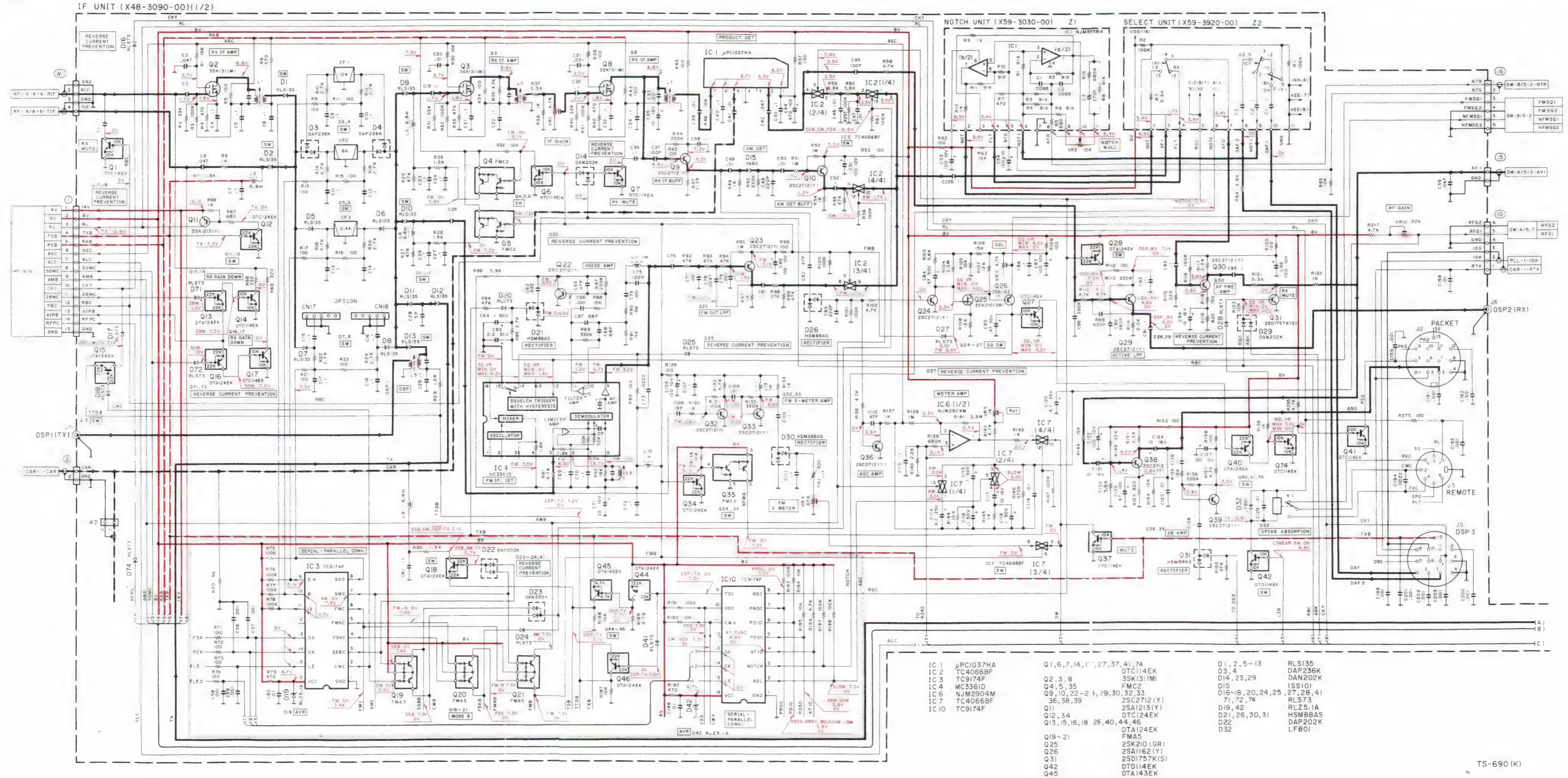


TS-450S CIRCUIT DIAGRAM

IF UNIT (X48-3090-01) : TS-450S

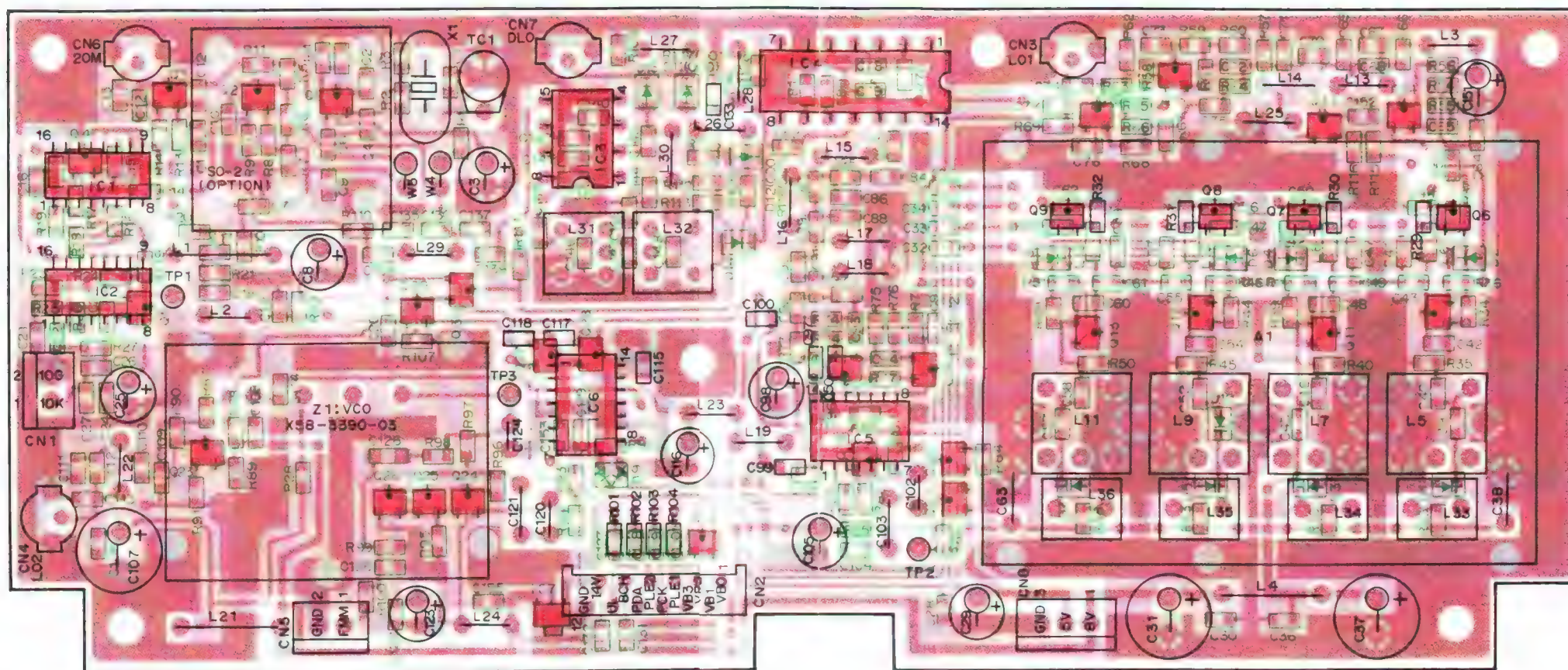
IF UNIT (X48-3090-01)(2/2)



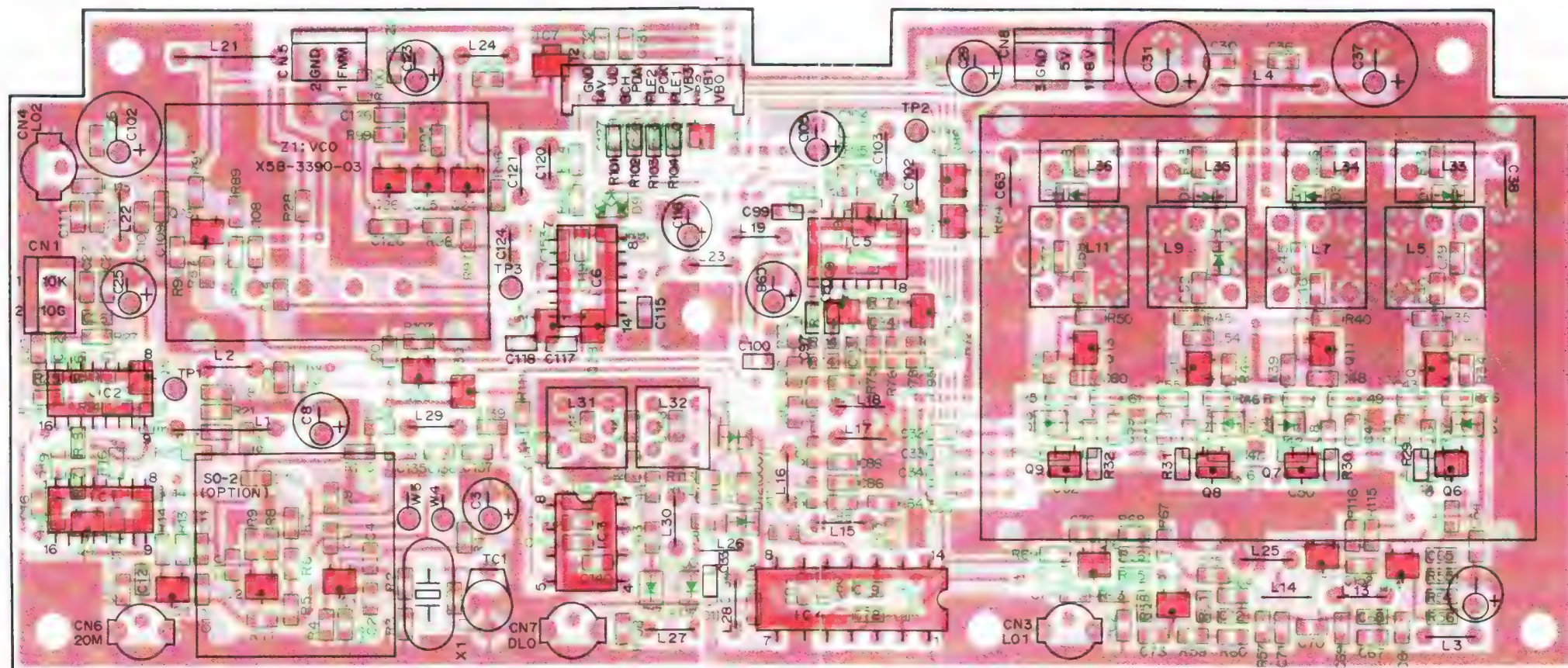




PLL UNIT (X50-3150-XX) Component side view
-00 : TS-690S -01 : TS-450S



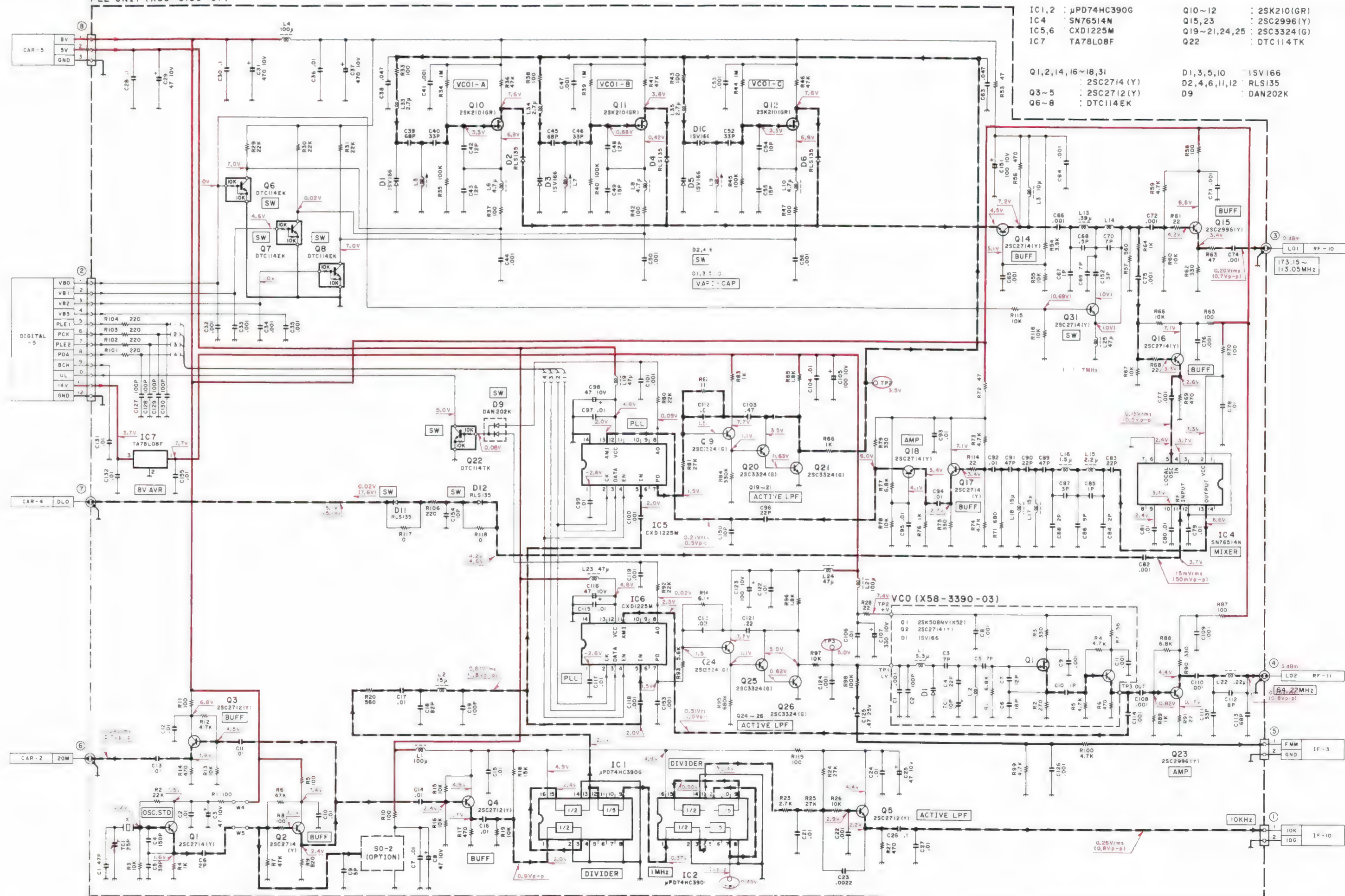
PLL UNIT (X45-3150-XX) Foil side view
-00 : TS-690S -01 : TS-450S



PLL UNIT (X50-3150-01) : TS-450S

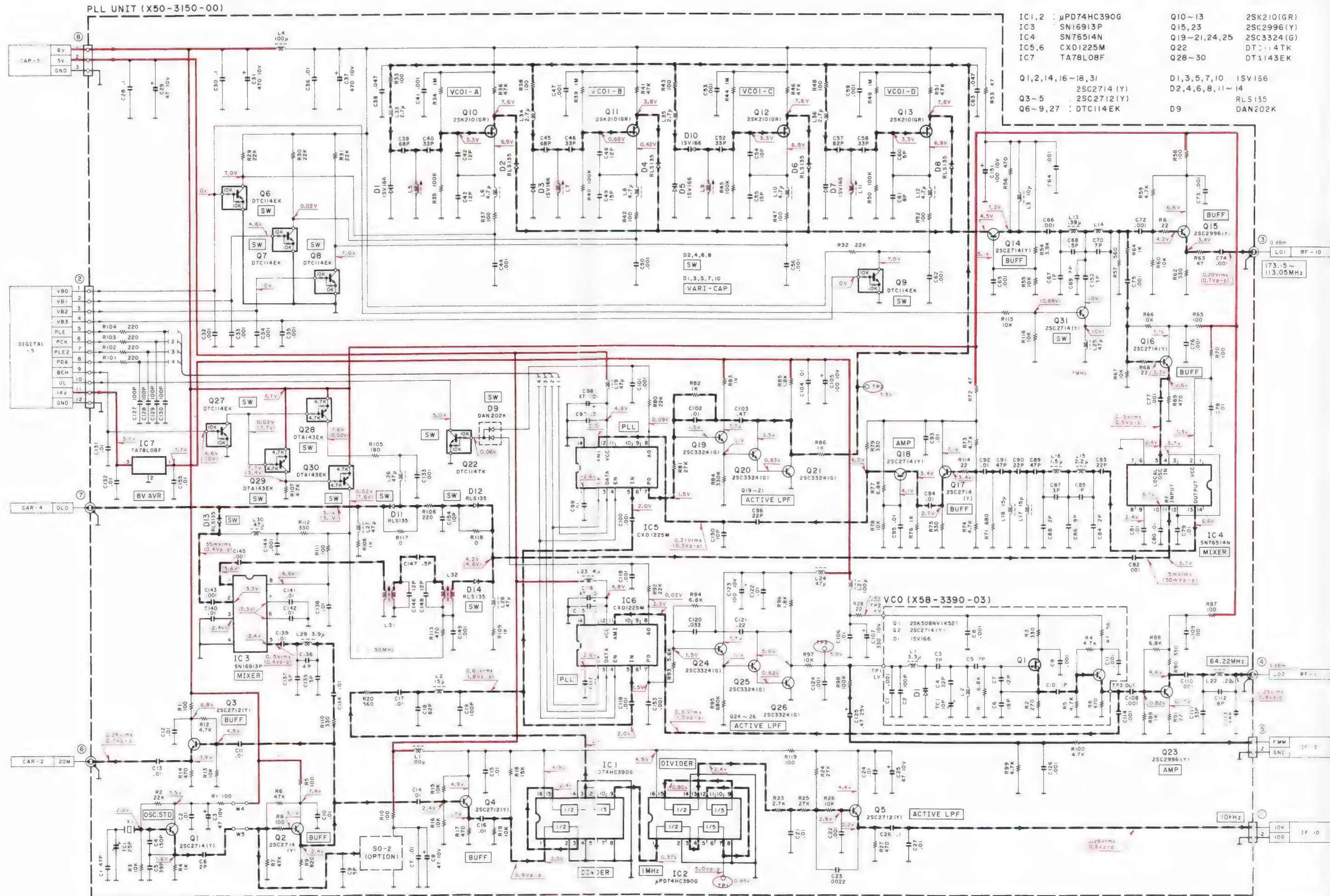
PLL UNIT (X50-3150-01)

CIRCUIT DIAGRAM / PC BOARD VIEWS TS-450S

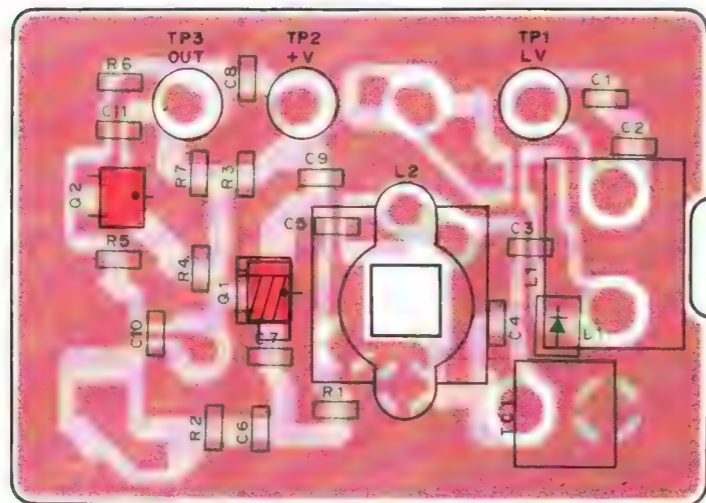


TS-690S CIRCUIT DIAGRAM / PC BOARD VIEWS

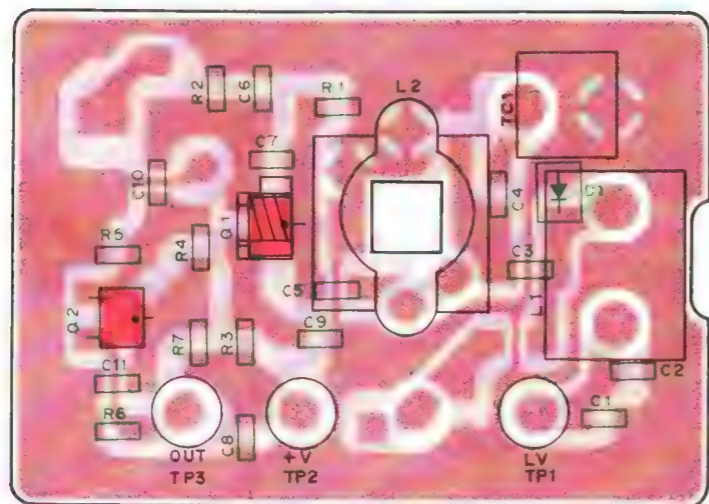
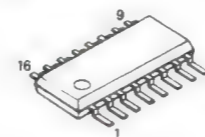
PLL UNIT (X50-3150-00) : TS-690S



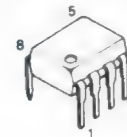
VCO2 (X58-3390-03) Component side view



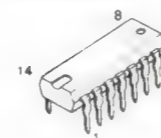
VCO2 (X58-3390-03) Foil side view

 μ PD74HC390G

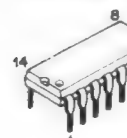
SN16913P



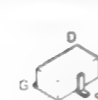
SN76514N



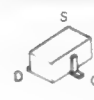
CXD1225M



2SK210



2SK508NV



TA78L08F



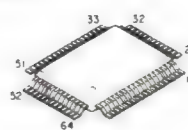
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2SC3324
2SC2714
2SC2712
DTC114EK
DTC114TK
DTA143EK



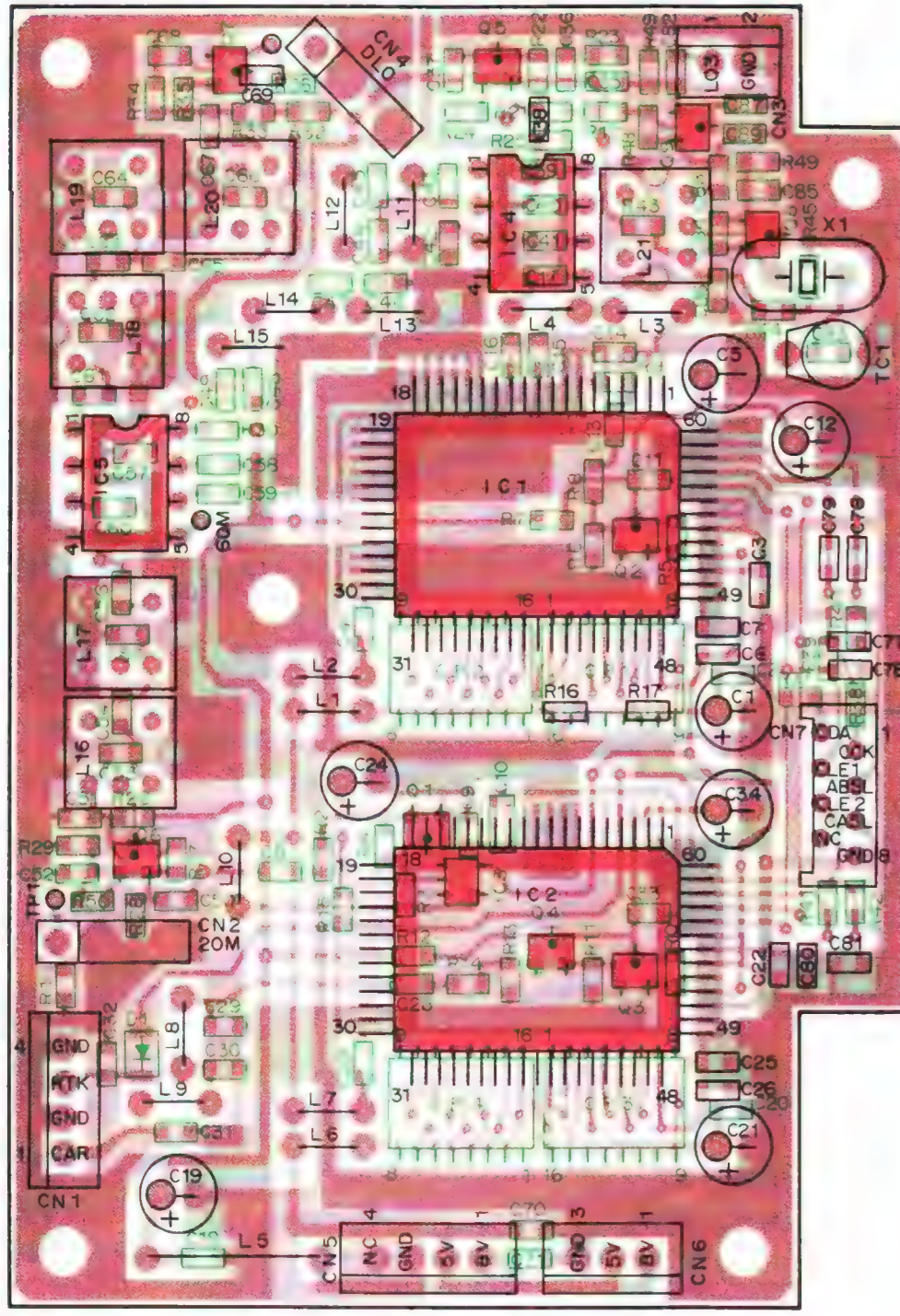
TC7S04F



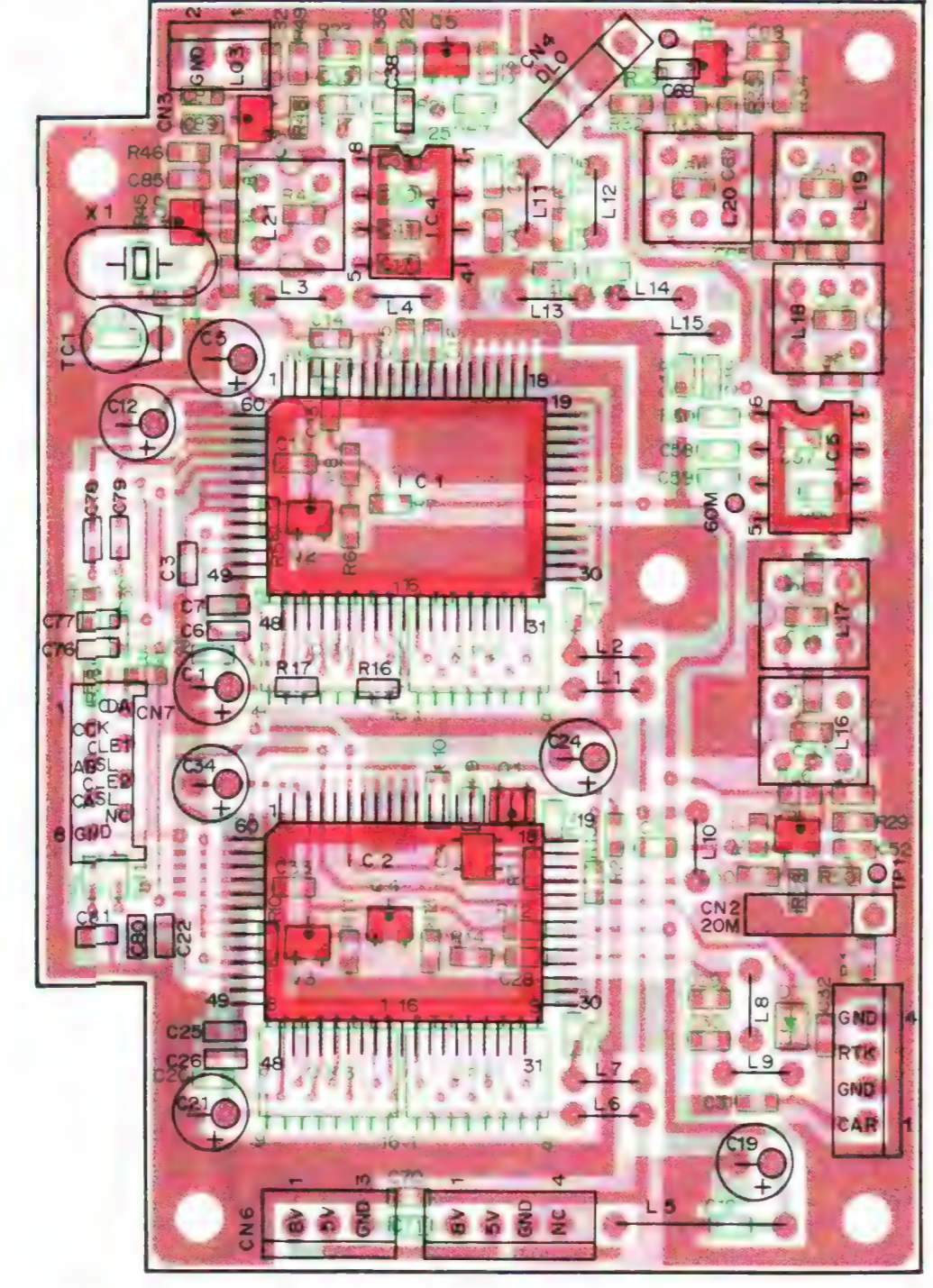
YM6631



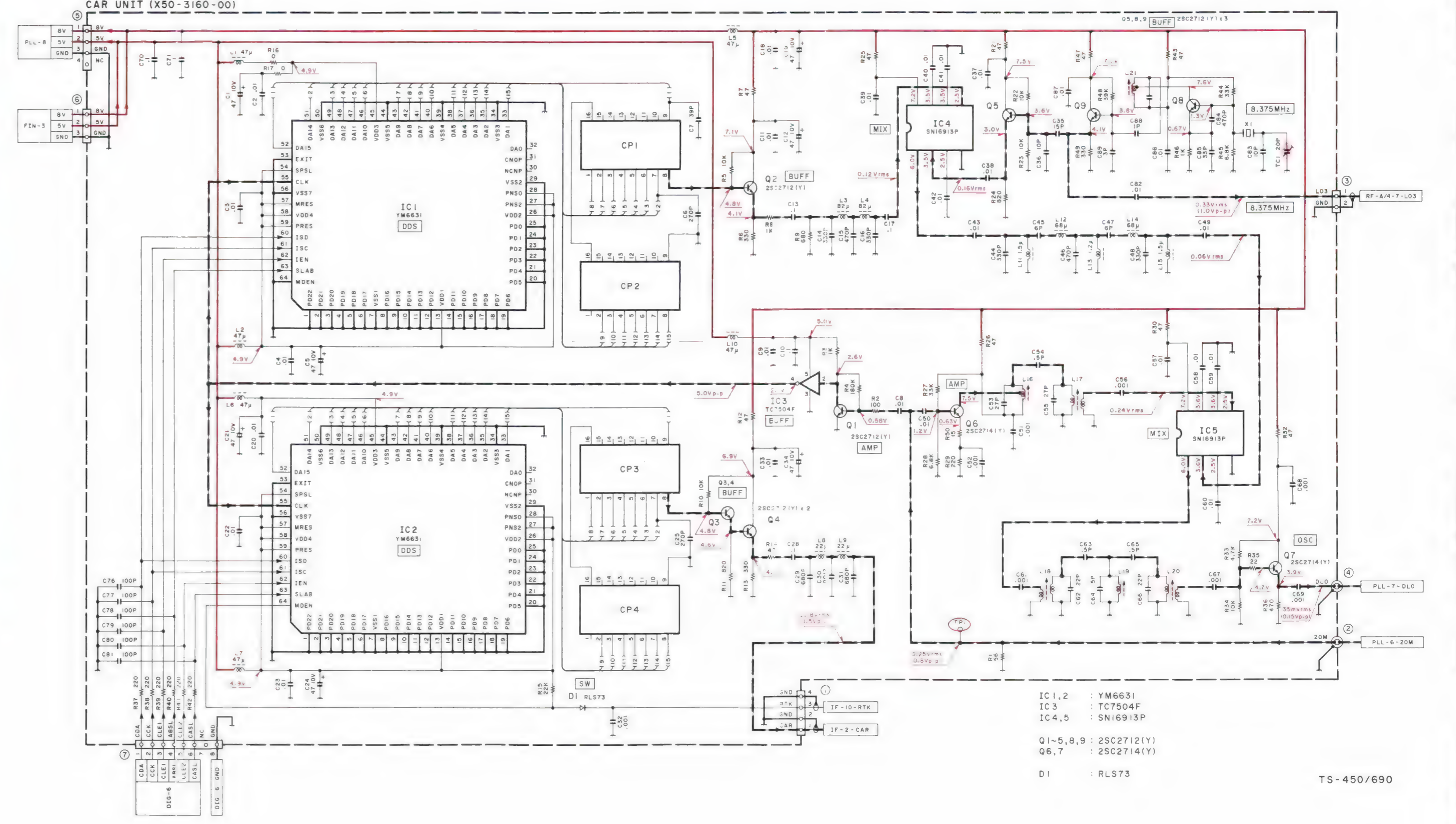
CAR UNIT (X50-3160-00) Component side view



CAR UNIT (X50-3160-00) Foil side view



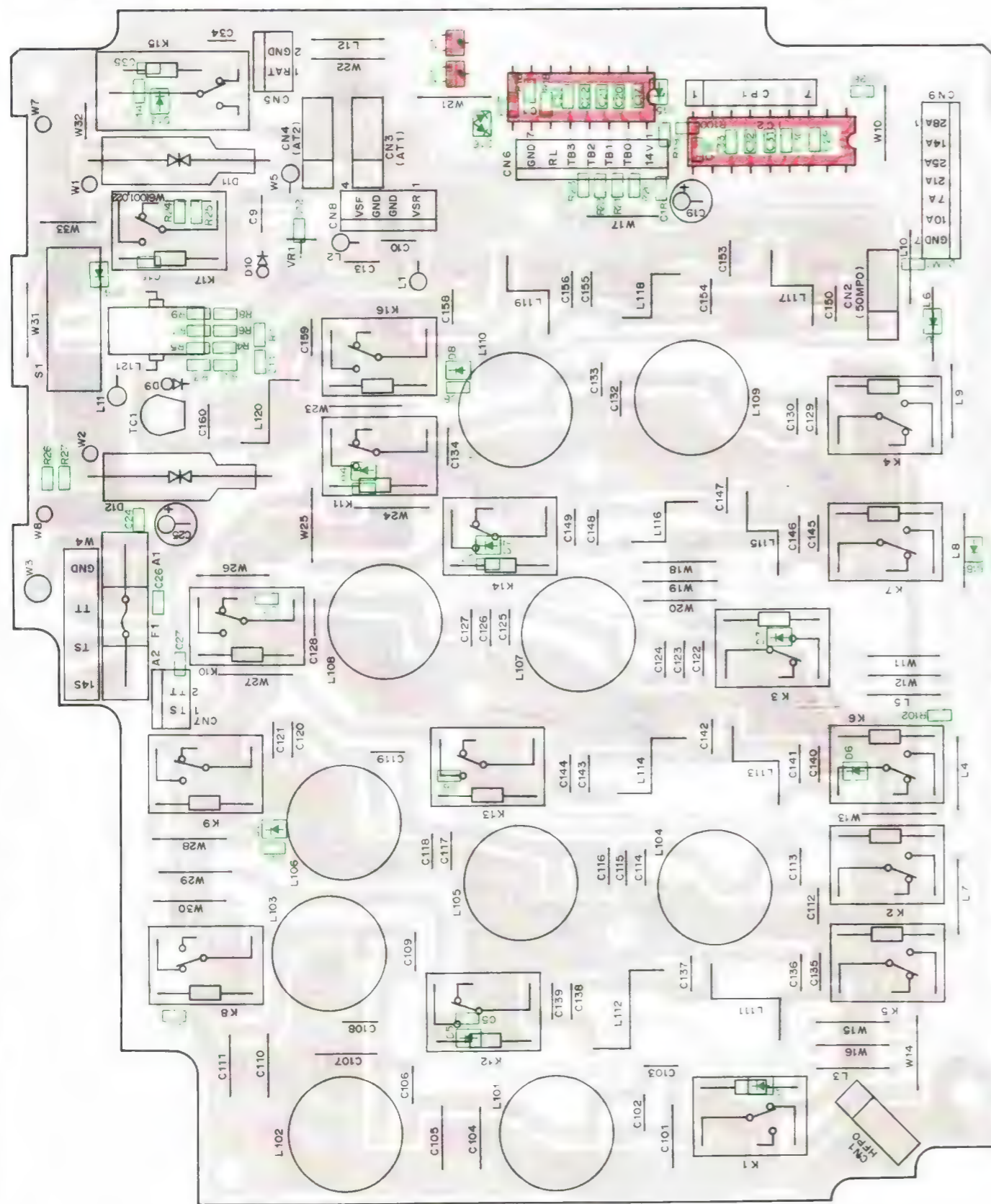
CAR UNIT (X50-3160-00)



TS-450S CIRCUIT DIAGRAM / PC BOARD VIEWS

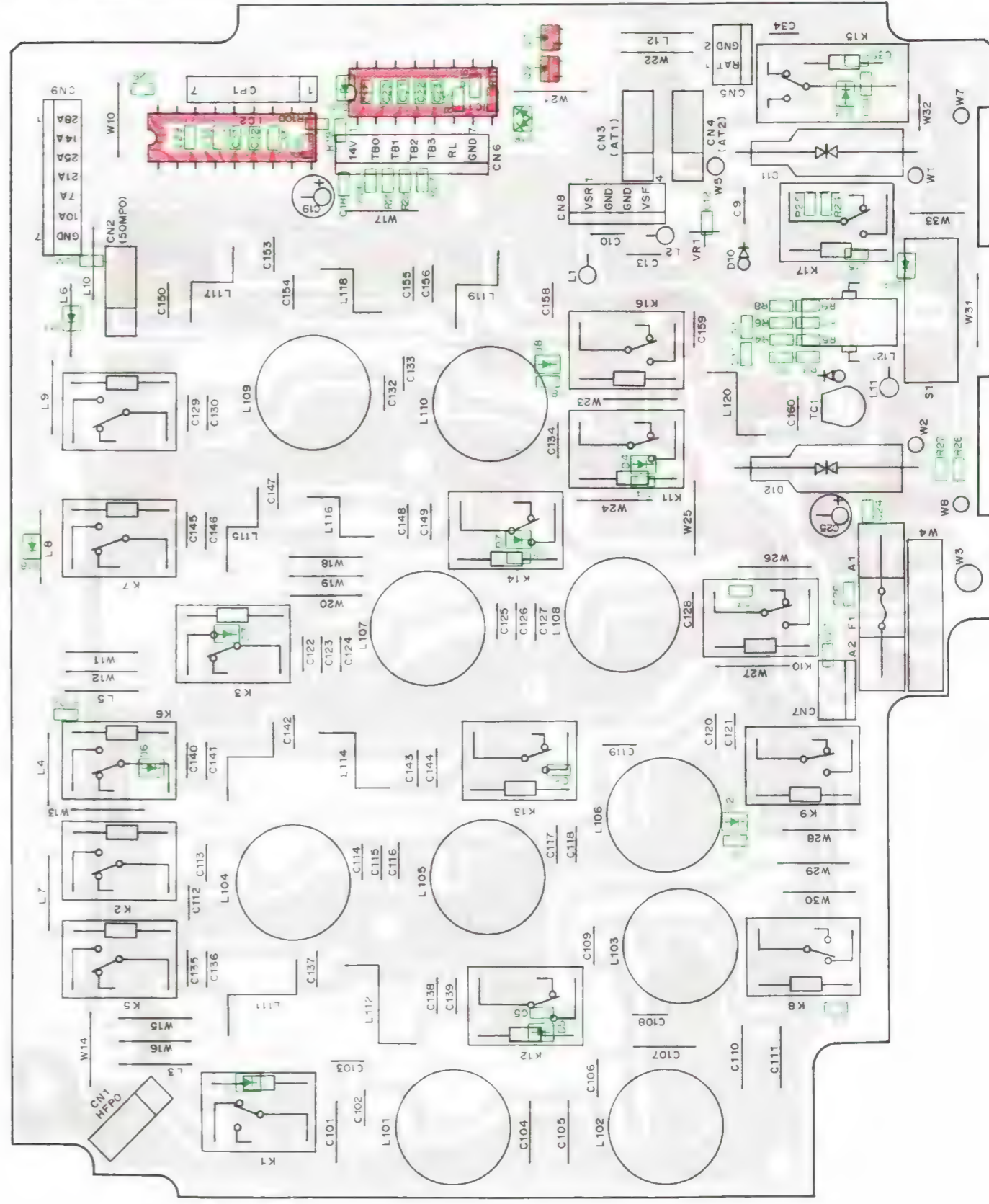
FILTER UNIT (X51-3110-XX) Component side view

-00 : TS-690S (K,X,P,E,E2) -01 : TS-450S (K,X,P,E,E2) -21 : TS-690S (M) -22 : TS-450S (M,M2)



FILTER UNIT (X51-3110-XX) Foil side view

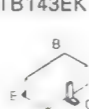
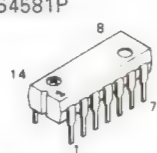
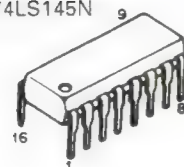
-00 : TS-690S (K,X,P,E,E2) -01 : TS-450S (K,X,P,E,E2) -21 : TS-690S (M) -22 : TS-450S (M,M2)



SN74LS145N

M54581P

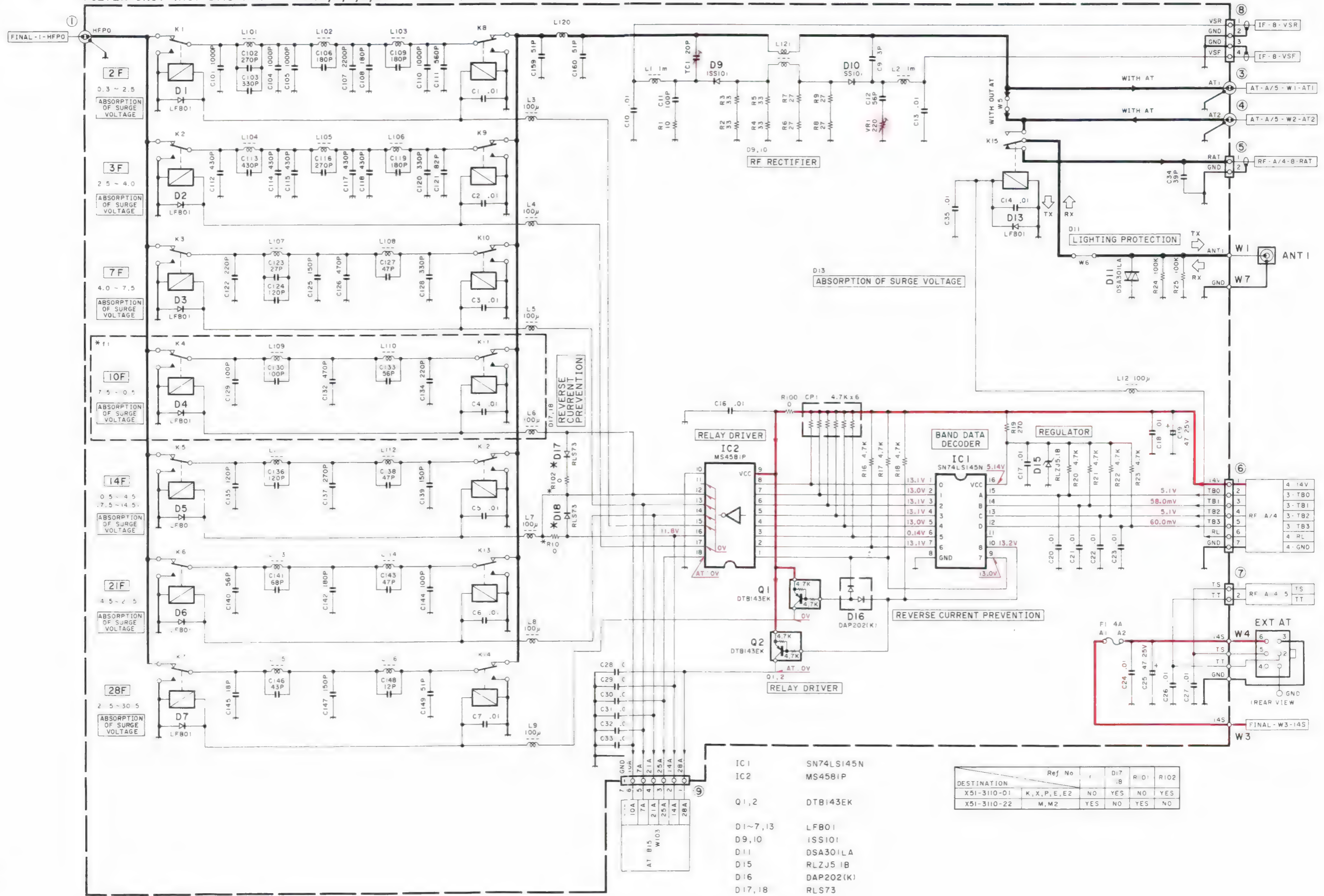
DTB143EK



FILTER UNIT (X51-3110-XX) : TS-450S

-01 : K,X,P,E,E2 -22 : M,M2

FILTER UNIT (X51-3110-XX) -00:(K,X,P,E,E2) -22:(M,M2)

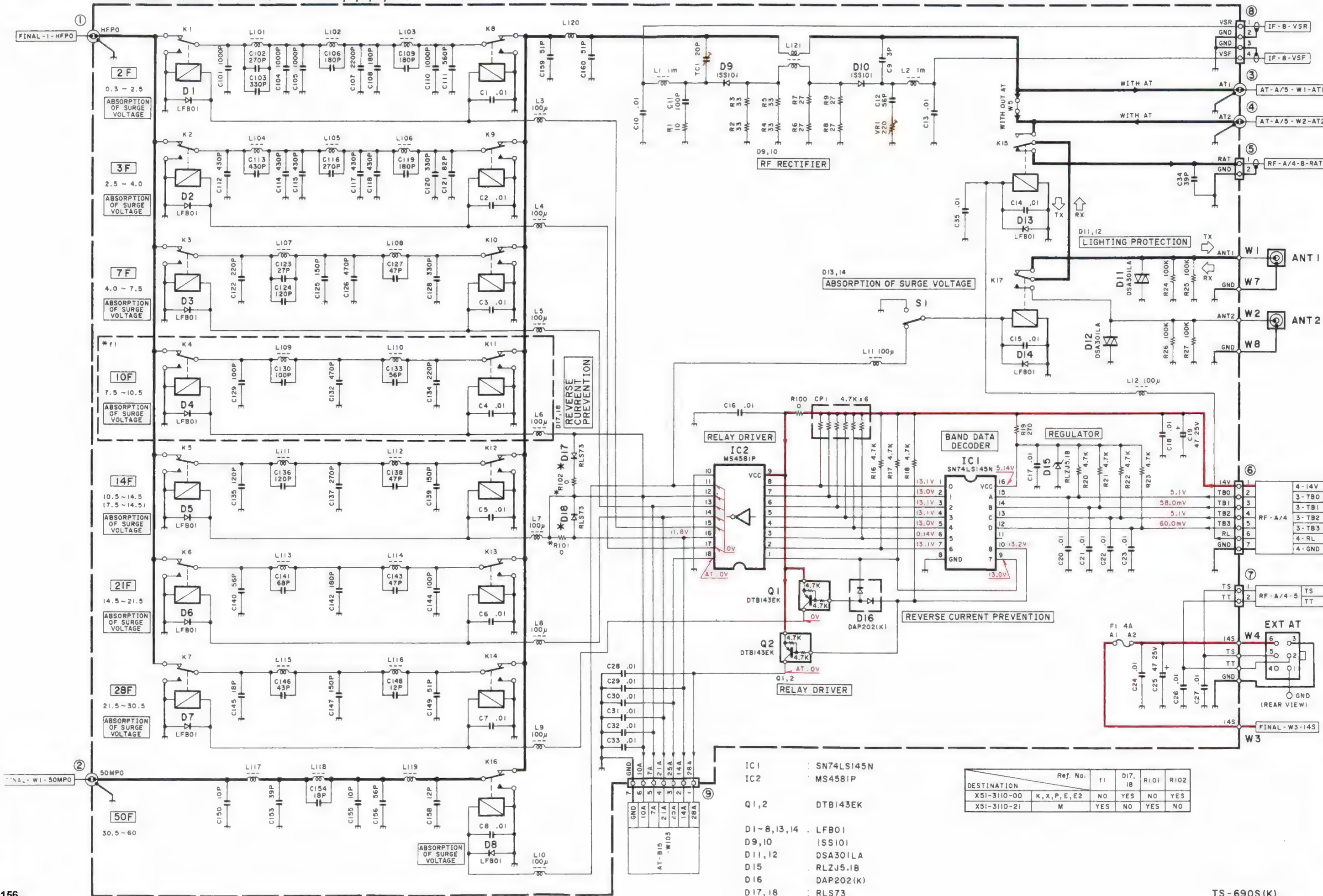


FILTER UNIT (X51-3110-XX) : TS-690S

-00 : K,X,P,E,E2 -21 : M

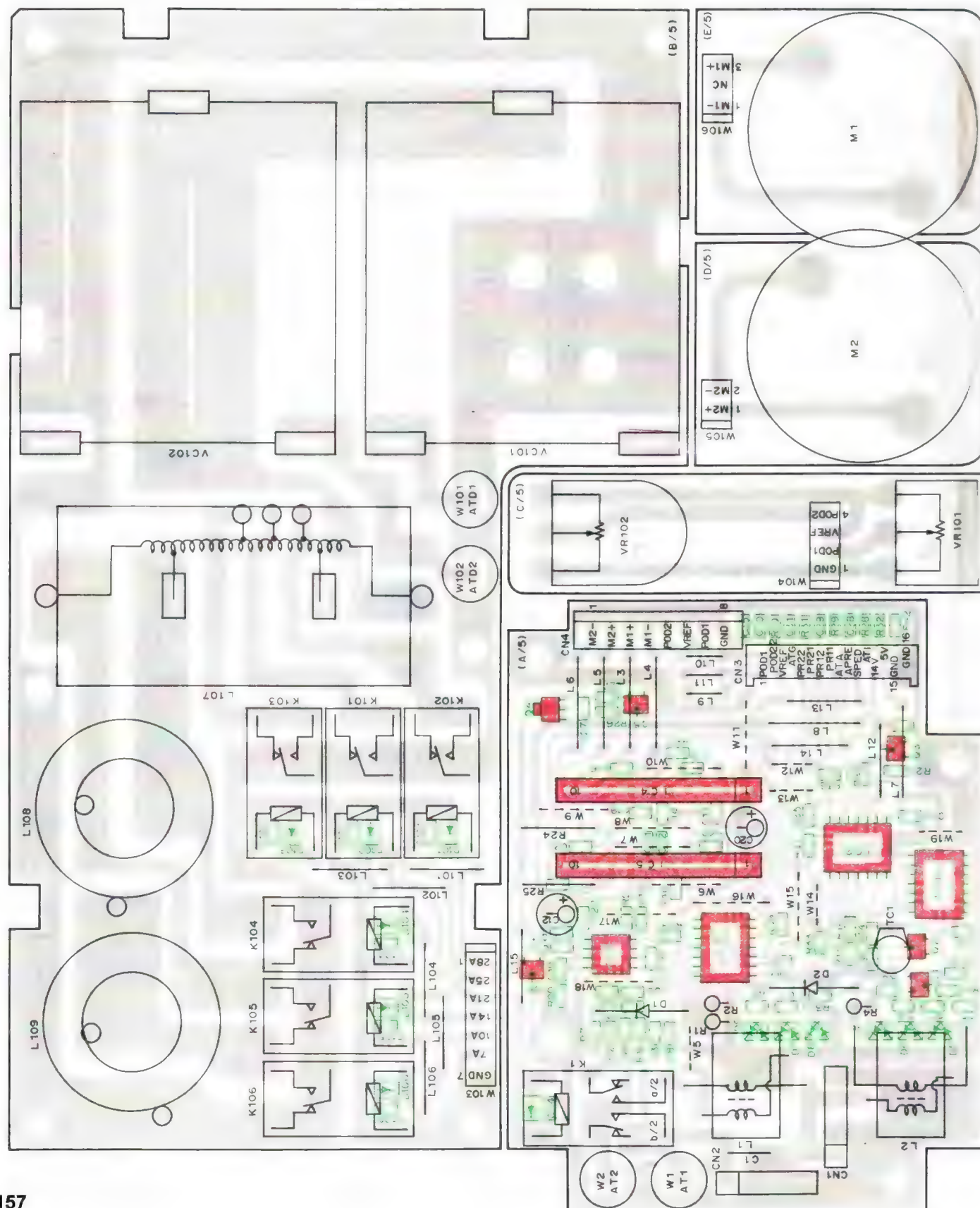
FILTER UNIT (X51-3110-XX) -00:(K,X,P,E,E2) -21:(M)

CIRCUIT DIAGRAM TS-690S

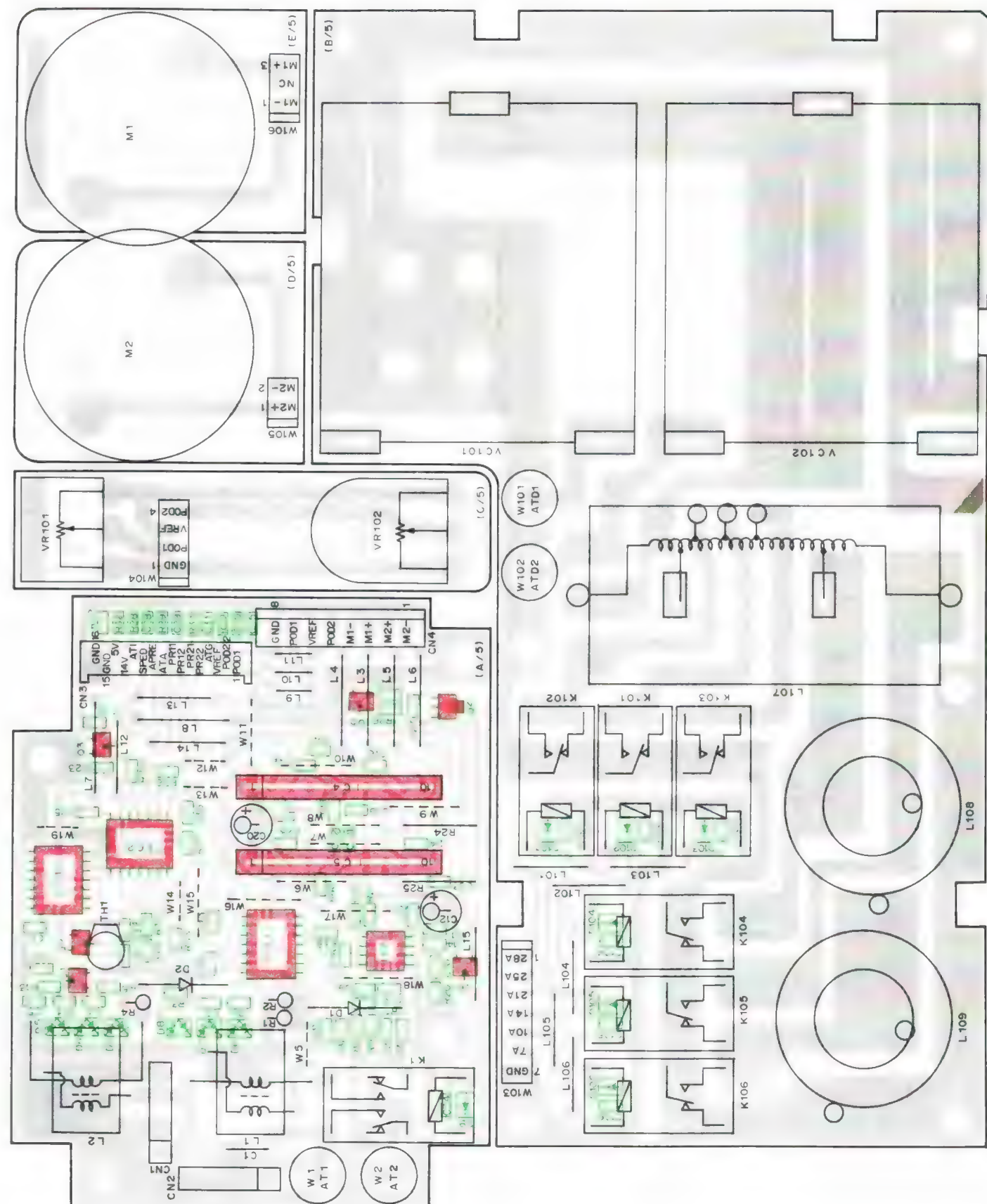


TS-450S PC BOARD VIEWS

AT UNIT/AT-450 (X53-3370-00) Component side view : TS-450S

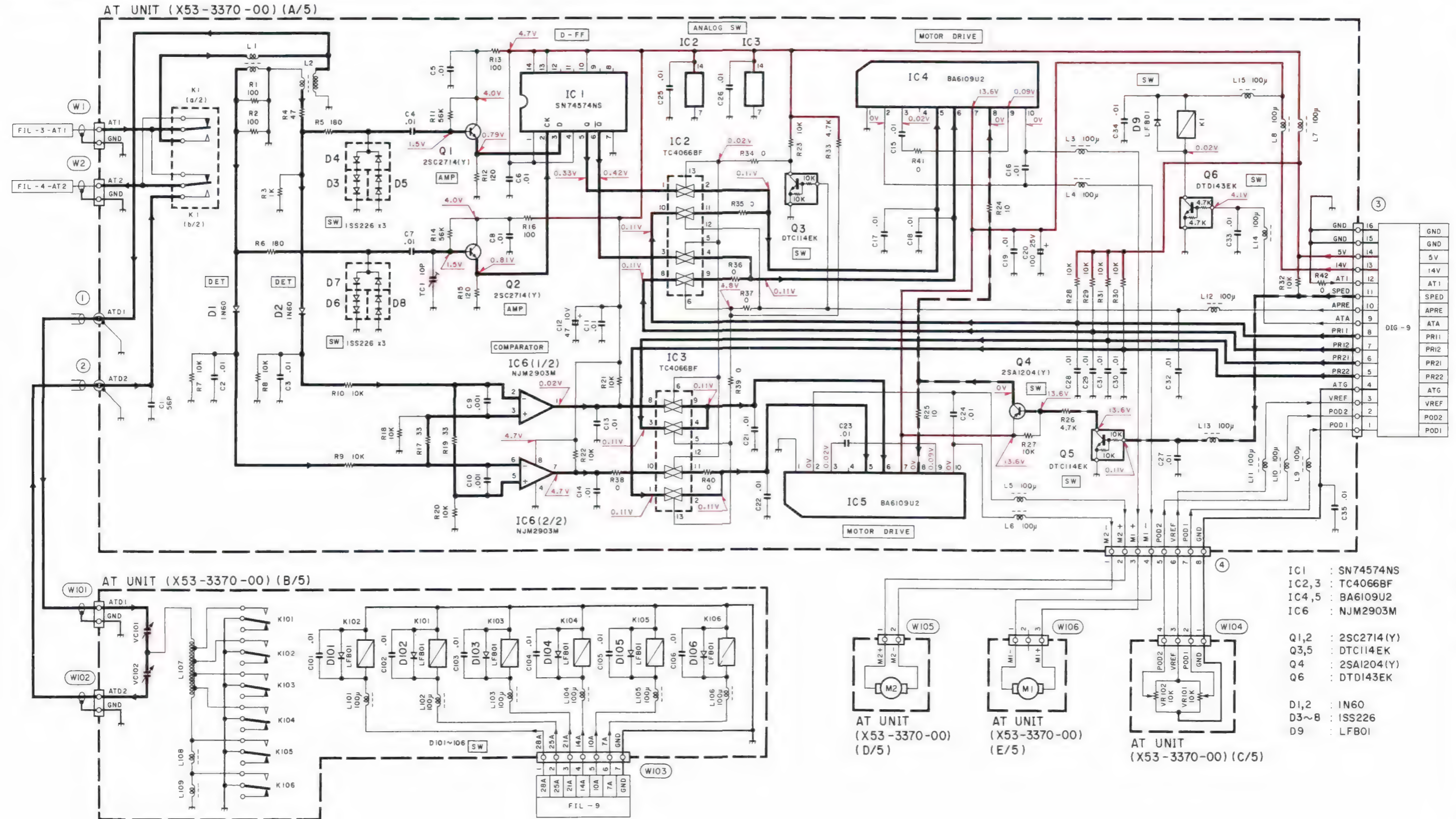


AT UNIT/AT-450 (X53-3370-00) Foil side view : TS-450S



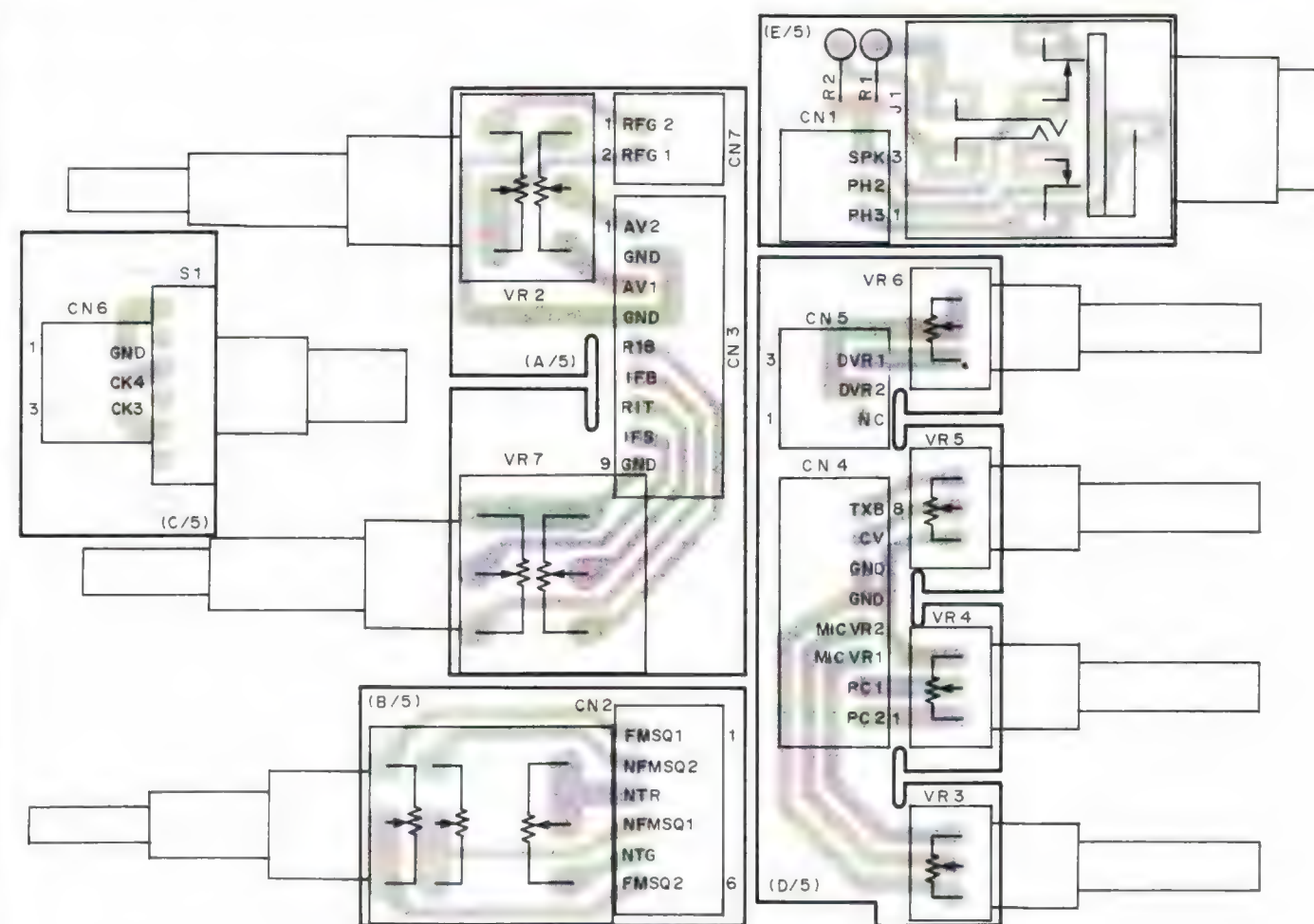
CIRCUIT DIAGRAM TS-450S

AT UNIT/AT-450 (X53-3370-00) : TS-450S

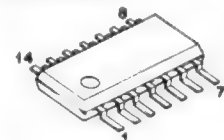


TS-450S/690S CIRCUIT DIAGRAM / PC BOARD VIEWS

SWITCH UNIT (X41-3170-00) Component side view



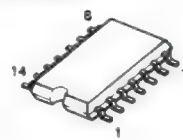
SN74S74NS



2SA1204



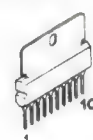
TC4066BF



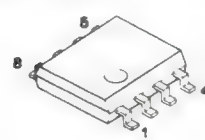
2SC2714
DTC114EK
DTD143EK



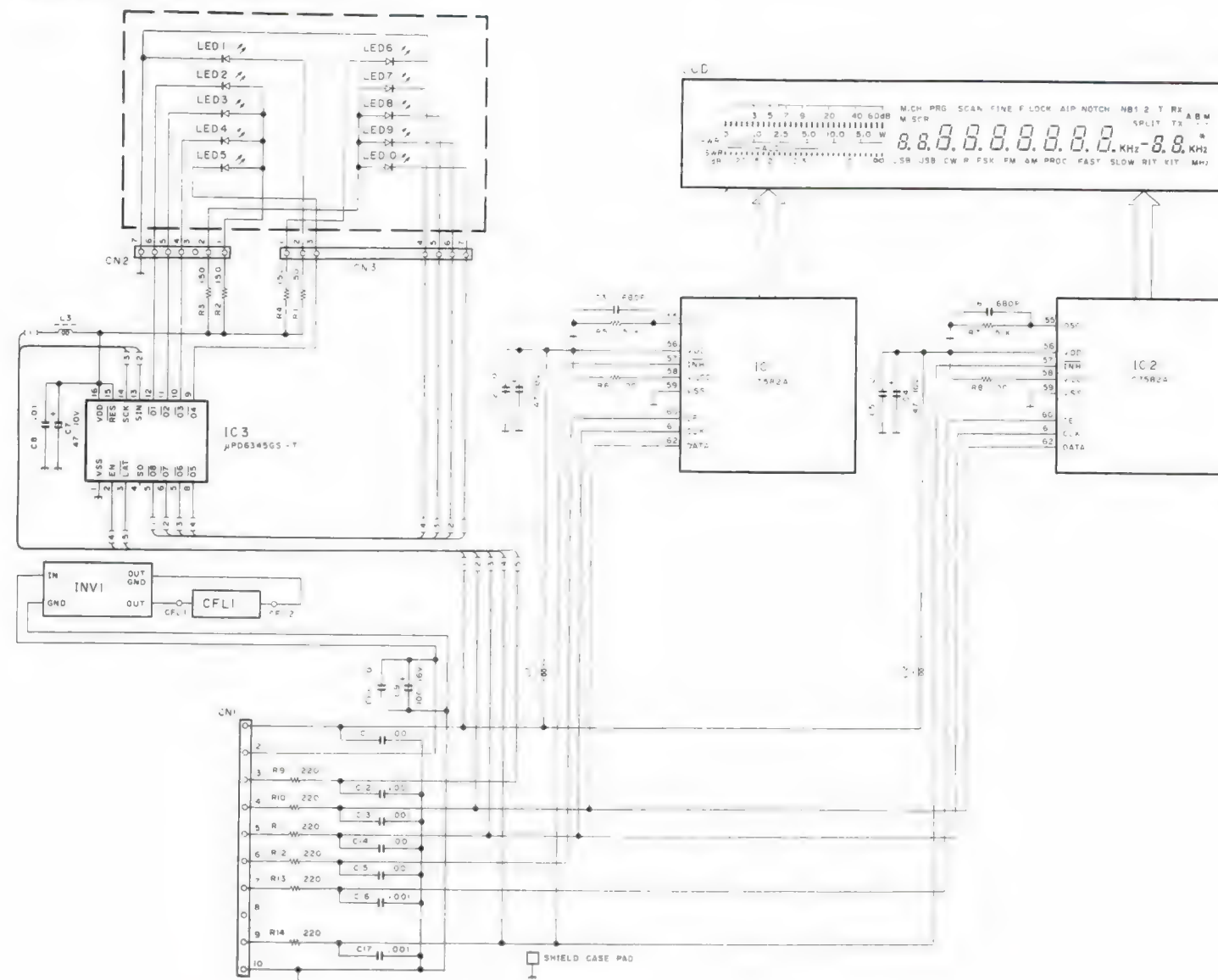
BA6109U2



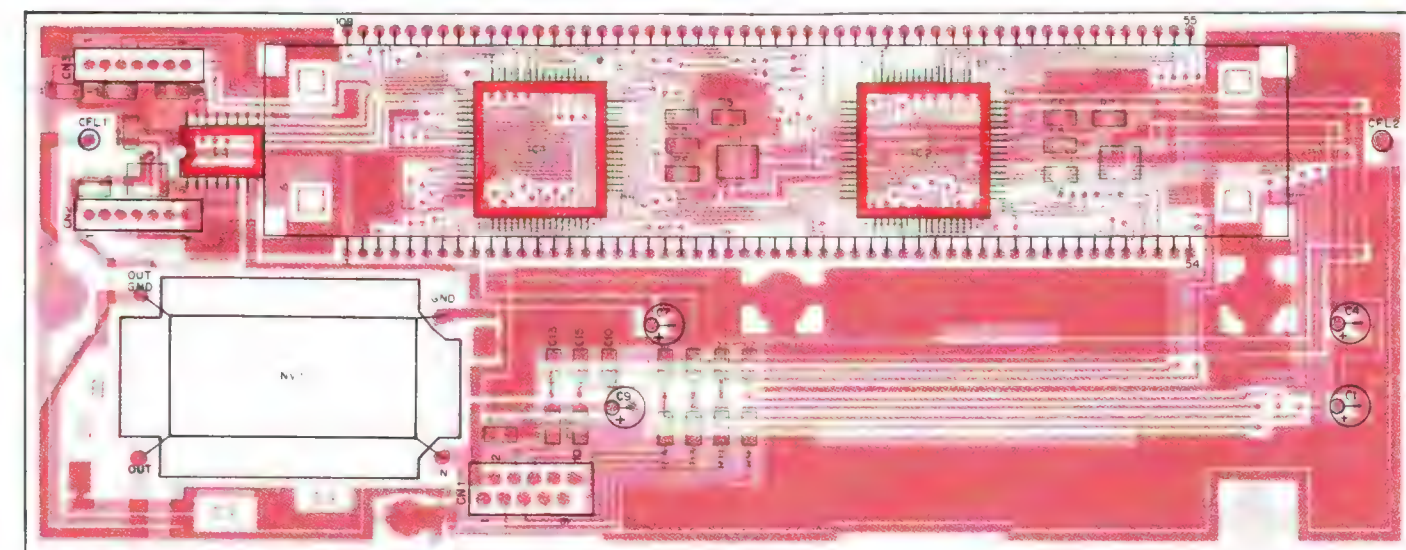
NJM2903M



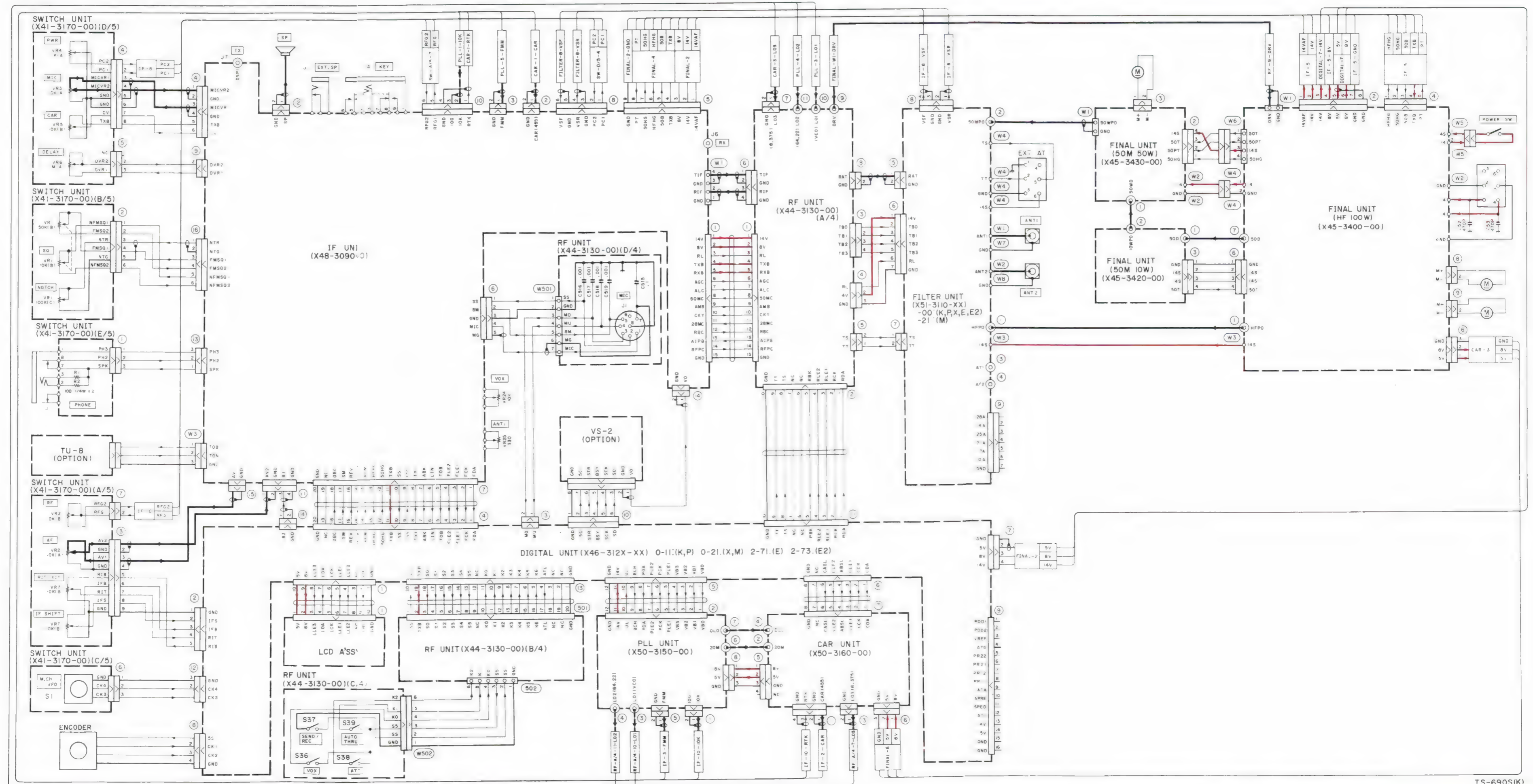
LCD ASSY (B38-0361-05)



LCD ASSY (B38-0361-05) Component side view



TS-690S SCHEMATIC DIAGRAM



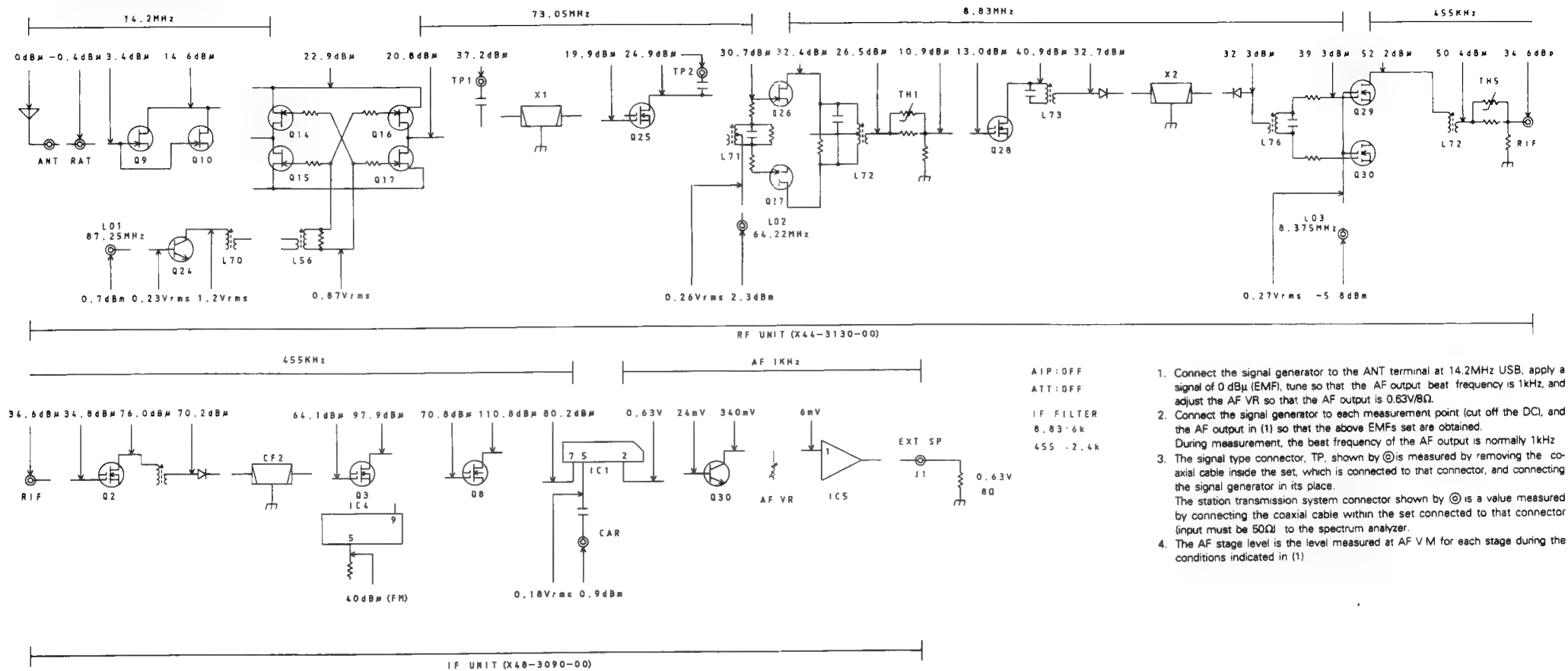
BLOCK DIAGRAM



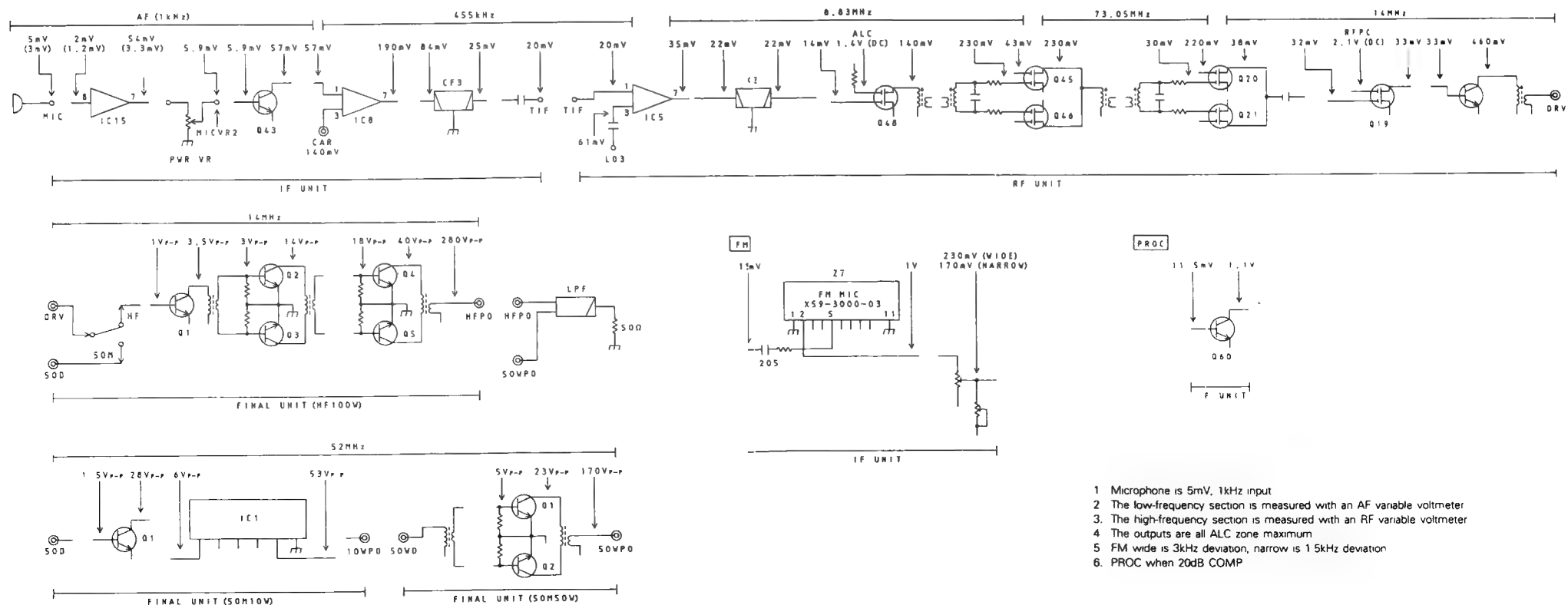
TS-450S/690S TS-450S/690S

LEVEL DIAGRAM

RX SECTION



TX SECTION



PS-33/53 (DC POWER SUPPLY)

PS-33/53 External View



| Model | PS-33 | PS-53 |
|--|--|--|
| Specifications | | |
| Power requirement | 120V AC \pm 10%, 60Hz (K,P) *120/220~230V AC \pm 10%, 50/60Hz (E,M) | 240V AC \pm 10%, 50/60Hz (T) |
| Output voltage | 13.8V DC (Reference) | |
| Rated output current | 20.5A (25% duty cycle) 15A (50% duty cycle) | 22.5A (25% duty cycle) 16A (50% duty cycle) 20.5A max. (Continuous operation for 1 hour) |
| Output voltage regulation | Within $\pm 0.7V$ (at 120/220~230/240V AC $\pm 10\%$ variation with 15A) Within 0.7V (at load current variation from 2 to 15A) | Within $\pm 0.7V$ (at 120/220~230/240V AC $\pm 10\%$ variation with 16A) Within 0.7V (at load current variation from 2 to 16A) |
| Ripple voltage | Less than 20mVrms (at 13.8V DC/15A) | Less than 20mVrms (at 13.8V DC/16A) |
| Power consumption | Approx. 500W (at 13.8V DC/20.5A) | Approx. 550W (at 13.8V DC/22.5A) |
| Dimensions (W x H x D) | 173 x 96 x 296 mm [173 x 107 x 322 mm] | |
| Dimensions in [] include projections | 6-13/16" x 3-25/32" x 11-21/32" [6-13/16" x 4-7/32" x 12-11/16"] | |
| Weight | Approx. 7.0kg (15.4lbs) | Approx. 6.9kg (15.2lbs) |

Notes

Rating are subject to change without notice due to advancements in technology.

* : Switchable.

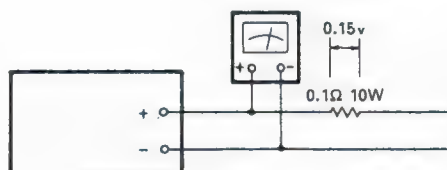
PS-33/53 Adjustment

• Voltage setting

1. Connect a load, pass a current of 15A (PS-33) or 20A (PS-53), and adjust the output voltage to $13.8 \pm 0.4V$ with VR1.
2. Make sure the output voltage is 16V or less when there is no load.

• Overcurrent protection

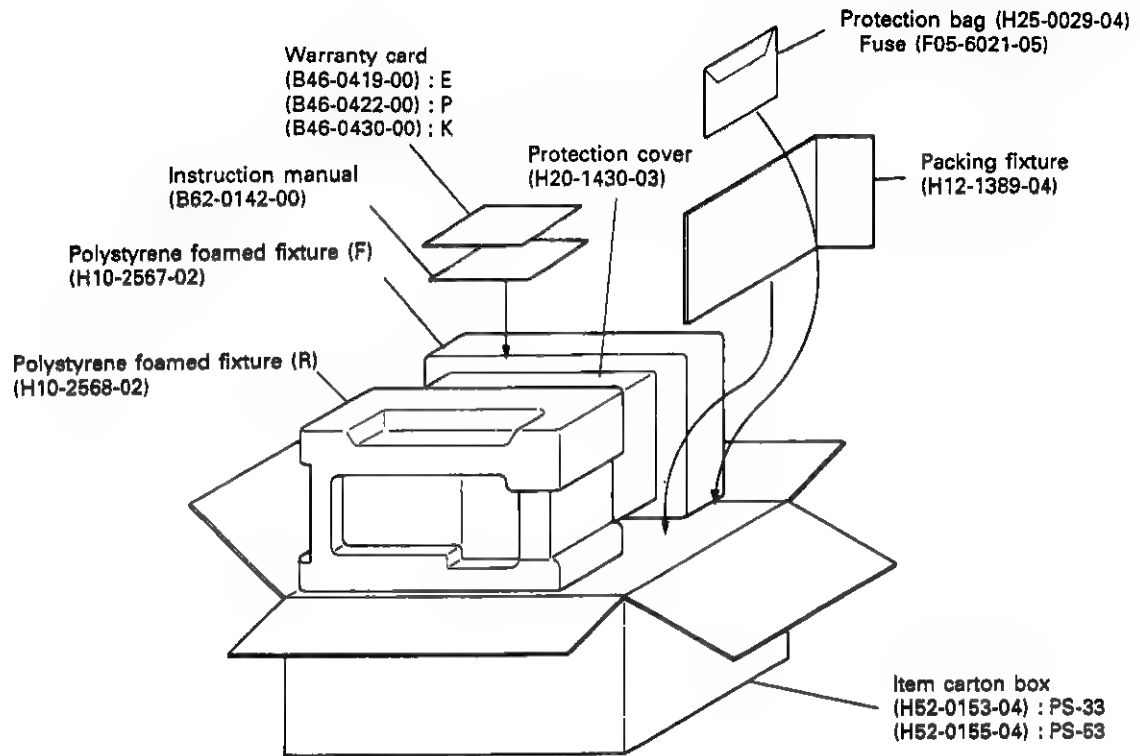
1. Switch the power off.
2. Connect a 0.1Ω , 10-W resistor to the output pin.
3. Switch the power on, and adjust the voltage across the resistor to 0.15V with VR2.



TS-450S/690S

PS-33/53 (DC POWER SUPPLY)

PS-33/53 Packing



PS-33/53 (DC POWER SUPPLY)

* New Parts

Parts without Parts No are not supplied.

Les articles non mentionnés dans le **Parti No.** ne sont pas fournis.

Te le ohne Parts No werden nicht geliefert

PS-33/53 Parts List

| Ref. No. | Address | New Parts | Parts No. | Description | Destination | Remarks |
|--------------|---------|-----------|-------------|--------------------------------|-------------|---------|
| 参照番号 | 位置 | 新 | 部品番号 | 部品名 / 規格 | 仕向 | 備考 |
| PS-33 | | | | | | |
| | | * | A01-2034-02 | METALLIC CABINET(UPPER) | KTP | |
| | | * | A01-2035-02 | METALLIC CABINET(LOWER) | EM | |
| | | * | A01-2036-02 | METALLIC CABINET(LOWER) | P | |
| | | | A23-1507-03 | REAR PANEL | TE | |
| | | | A23-1522-03 | REAR PANEL | | |
| | | * | A62-0119-03 | PANEL | | |
| | | * | A82-0006-03 | REAR PANEL | K | |
| | | * | A82-0007-03 | REAR PANEL | P | |
| | | | B41-0659-14 | CAUTION LABEL(LA) | KP | |
| | | | B41-0660-04 | CAUTION LABEL(LA) | KP | |
| | | | B42-2454-04 | LABEL(CARTON BOX) | | |
| | | | B42-3343-04 | LABEL(S/NO.) | | |
| | | | B42-3346-04 | LABEL(FUSE) | K | |
| | | * | B42-3349-04 | LABEL(120/230V) | E | |
| | | | B42-3354-04 | LABEL(FUSE,PCB) | TEM | |
| | | | B42-3355-04 | LABEL(GND) | TEP | |
| | | | B42-3374-04 | LABEL(120/220V) | M | |
| | | | B46-0419-00 | WARRANTY CARD | E | |
| | | | B46-0422-00 | WARRANTY CARD | P | |
| | | | B46-0430-00 | WARRANTY CARD | K | |
| | | * | B62-0142-00 | INSTRUCTION MANUAL | | |
| | | * | B72-0226-04 | NAME PLATE(120V) | KP | |
| | | * | B72-0227-04 | NAME PLATE(120/230-330V) | EM | |
| | | * | B72-0228-04 | NAME PLATE(240V) | T | |
| C1 -4 | | | CK45F1H103Z | CERAMIC 0.010UF Z | | |
| C5 ,6 | | | C90-2034-05 | ELECTRO 22000UF 25WV | | |
| C7 | | | CK45F1H473Z | CERAMIC 0.047UF Z | | |
| C8 | | | CK45F1H103Z | CERAMIC 0.010UF Z | | |
| | | | E20-0284-05 | TERMINAL PLATE | | |
| | | | E30-0602-05 | AC CORD | T | |
| | | | E30-0974-05 | AC CORD | M | |
| | | | E30-2120-05 | AC CORD | K | |
| | | | E30-2125-05 | AC CORD | P | |
| | | | E30-2153-05 | AC CORD | E | |
| | | | E31-3373-15 | CONNECTING WIRE(TR(E)) | | |
| | | | E31-3374-05 | CONNECTING WIRE(B-TERMINAL(+)) | | |
| | | | E31-3375-05 | CONNECTING WIRE(B-TERMINAL(-)) | | |
| | | | E31-3376-05 | CONNECTING WIRE(B-ELECTRO(-)) | | |
| | | | E31-3377-05 | CONNECTING WIRE(CN3) | | |
| | | | E31-3378-15 | CONNECTING WIRE(FAN MOTOR) | | |
| | | | E31-3379-05 | CONNECTING WIRE(TR(B)-CN1) | | |
| | | | E33-1827-10 | FINISHED WIRE SET | TP | |
| | | * | E33-1954-05 | FINISHED WIRE SET | K | |
| | | * | E33-1955-05 | FINISHED WIRE SET | EM | |
| | | | F01-0962-13 | HEAT SINK | | |
| | | | F05-4024-05 | FUSE(4A) | TEM | |
| | | | F05-6021-05 | FUSE(6A,ACSY) | EM | |
| | | | F05-6021-05 | FUSE(6A) | KP | |
| | | | F09-0423-15 | FAN | | |
| M1 | | | F29-0436-04 | INSULATOR(TRANSISTOR) | | |

L-Scandinavia

K:USA

P:Canada

Y:PX(Far East, Hawaii)

T:England

E-Europe

Y:AAFES(Europe)

X: Australia

M:Other Areas

▲ indicates safety critical components.

TS-450S/690S

PS-33/53 (DC POWER SUPPLY)

✱ New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Telle ohne Parts No. werden nicht geliefert.

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|---|--|------------------------|--------------------|
| | | | H10-2567-02 H10-2568-02 H12-1369-04 H20-1430-03 H25-0029-04 | POLYSTYREN FOAMED FIXTURE(F) POLYSTYREN FOAMED FIXTURE(R) PACKING FIXTURE PROTECTION COVER PROTECTION BAG(FUSE) | | |
| | | * | H25-0105-04 H52-0153-04 | PROTECTION BAG(AC CORD) ITEM CARTON BOX | | |
| | | | J02-0323-05 J02-0442-04 J02-0443-04 J13-0033-15 J21-4135-04 | FOOT(REAR) FOOT(FRONT) FOOT(SUB) FUSE HOLDER LEAD HOLDER(PANEL) | K | |
| | | * | J21-4179-04 J21-4365-03 J42-0024-15 J42-0083-05 J42-0085-05 | MOUNTING HARDWARE MOUNTING HARDWARE BUSHING BUSHING(AC) BUSHING(AC) | KP M TE | |
| | | | J61-0307-05 | WIRE BAND | | |
| | | | K29-4636-04 | KNOB | | |
| | | | L01-8442-05 L07-1014-05 L07-1015-05 | POWER TRANSFORMER POWER TRANSFORMER(120V) POWER TRANSFORMER(115/230V) | T KP EM | |
| | | * | N09-0372-04 N09-0669-05 N09-2033-04 N14-0535-04 N16-0040-46 | SCREW(THERNISTOR) SCREW(GND) SCREW(TRANSISTOR) NUT(TRANSISTOR) SPLING WASHER(DIODE) | TEP | |
| | | | N19-0642-04 N30-3004-46 N30-4018-46 N35-3006-41 N35-3008-41 | FLAT WASHER(TRANSISTOR) PAN HEAD MACHIN SCREW PAN HEAD MACHIN SCREW(DIODE) BINDING HEAD MACHINE SCREW BINDING HEAD MACHINE SCREW | | |
| | | | N35-4006-41 N35-4006-41 N50-3008-41 N87-3006-41 N87-3006-46 | BINDING HEAD MACHINE SCREW BINDING HEAD MACHINE SCREW BINDING HEAD TAPTITE SCREW BRAZIER HEAD TAPTITE SCREW BRAZIER HEAD TAPTITE SCREW | EM | |
| | | | N87-3008-45 N87-3008-46 N87-3014-46 N88-3008-46 | BRAZIER HEAD TAPTITE SCREW BRAZIER HEAD TAPTITE SCREW BRAZIER HEAD TAPTIPE SCREW FLAT HEAD TAPTITE SCREW | | |
| | | | S40-1416-05 S31-2126-05 | PUSH SWITCH SLIDE SWITCH | EM | |
| | | | S25VB10 SLP144B 2N5885 | DIODE DIODE TRANSISTOR | | |
| | | | X43-3030-01 | POWER SUPPLY UNIT | | |
| PS-53 | | | | | | |
| | | * | A01-2037-02 | CASE(UPPER) | KTP | |
| | | * | A01-2038-02 | CASE(LOWER) | EM | |
| | | * | A01-2039-02 | CASE(LOWER) | | |

L-Scandinavia

K-USA

P:Canada

Y:PX(Far East, Hawaii)

T:England

E:Europe

Y:AAFES(Europe)

X:Australia

Other Areas

A indicates safety critical components.

PS-33/53 (DC POWER SUPPLY)

* New Parts
Parts without Parts No. are not supplied.
Les articles non mentionnes dans le Parts No. ne sont pas fournis.
Teile ohne Parts No. werden nicht geliefert.

| Ref. No. | Address | New Parts | Parts No. | Description | Desti-nation | Re-marks |
|----------|---------|-----------|-------------|-------------------------------|--------------|----------|
| 参照番号 | 位置 | 新 | 部品番号 | 部品名 / 規格 | 仕向 | 備考 |
| | | | A23-1507-03 | REAR PANEL | M | |
| | | | A23-1522-03 | REAR PANEL | TE | |
| | | * | A62-0120-03 | PANEL | K | |
| | | | A82-0006-03 | REAR PANEL | P | |
| | | | A82-0007-03 | REAR PANEL | | |
| | | | B41-0659-14 | LABEL(LA) | KP | |
| | | | B41-0660-04 | LABEL(LA) | KP | |
| | | | B42-2454-04 | LABEL(ITEM CARTON BOX) | | |
| | | * | B42-3343-04 | LABEL(S/NO) | TEM | |
| | | | B42-3354-04 | LABEL(FUSE,PCB) | | |
| | | | B42-3355-04 | LABEL(GND) | TEP | |
| | | | B42-3374-04 | LABEL(120/220V) | M | |
| | | * | B42-3446-04 | LABEL(FUSE) | K | |
| | | | B42-3449-04 | LABEL(120/230V) | E | |
| | | | B46-0419-00 | WARRANTY CARD | E | |
| | | | B46-0422-00 | WARRANTY CARD | P | |
| | | | B46-0430-00 | WARRANTY CARD | K | |
| | | * | B62-0142-00 | INSTRUCTION MANUAL | | |
| | | * | B72-0230-04 | NAME PLATE(120V) | KP | |
| | | * | B72-0231-04 | NAME PLATE(120/220-230V) | EM | |
| | | * | B72-0232-04 | NAME PLATE(240V) | T | |
| C1 -4 | | | CK45F1H103Z | CERAMIC 0.010UF Z | | |
| C5 ,6 | | | C90-2034-05 | ELECTRO 22000UF 25WV | | |
| C7 | | | CK45F1H473Z | CERAMIC 0.047UF Z | | |
| C8 | | | CK45F1H103Z | CERAMIC 0.010UF Z | | |
| △ | | | E20-0284-05 | TERMINAL PLATE | | |
| △ | | | E30-0602-05 | AC CORD | T | |
| △ | | | E30-0974-05 | AC CORD | M | |
| △ | | | E30-2120-05 | AC CORD | K | |
| △ | | | E30-2125-05 | AC CORD | P | |
| △ | | | E30-2153-05 | AC CORD | E | |
| | | | E31-3373-15 | CONNECTING WIRE(TR(E) | | |
| | | | E31-3374-05 | CONNECTING WIRE(B-TERMINAL(+) | | |
| | | | E31-3375-05 | CONNECTING WIRE(G-TERMINAL(-) | | |
| | | | E31-3376-05 | CONNECTING WIRE(G-ELECTRO(-) | | |
| | | | E31-3377-05 | CONNECTING WIRE(CN3) | | |
| | | | E31-3378-15 | CONNECTING WIRE(FAN MOTOR) | | |
| | | | E31-3379-05 | CONNECTING WIRE(TR(B)-CN1 | | |
| △ | | | E33-1825-10 | FINISHED WIRE SET | TP | |
| | | * | E33-1952-05 | FINISHED WIRE SET | K | |
| | | * | E33-1953-05 | FINISHED WIRE SET | EM | |
| | | | F01-0962-13 | HEAT SINK | | |
| | | | F29-0436-04 | INSULATOR(TRANSISTOR) | | |
| F1 | | | F05-4024-05 | FUSE(4A) | TEM | |
| △ | | | F05-6021-05 | FUSE(6A) | KP | |
| △ | | | F05-6021-05 | FUSE(6A,ACSY) | EM | |
| | | | F09-0423-15 | FAN | | |
| M1 | | | H10-2567-02 | POLYSTYREN FOAMED FIXTURE(F) | | |
| | | | H10-2568-02 | POLYSTYREN FOAMED FIXTURE(R) | | |
| | | | H12-1389-04 | PACKING FIXTURE | | |
| | | | H20-1430-03 | PROTECTION COVER | | |
| | | | H25-0029-04 | PROTECTION BAG(FUSE) | | |

L:Scandinavia U:USA P:Canada
Y:PX(Far East, Hawaii) T:England E:Europe
Y:AAFES(Europe) A:Australia M:Other Areas

△ indicates safety critical components.

TS-450S/690S

PS-33/53 (DC POWER SUPPLY)

× New Parts
Parts without Parts No. are not supplied
Les articles non mentionnes dans le Parts No. ne sont pas fournis
Teile ohne Parts No. werden nicht geliefert.

| Ref. No. | Address | New Parts | Parts No. | Description | Desti- nation | Re- marks | | | | | |
|--|-------------------|-----------|---------------------------------|---------------------------------|------------------|--------------|---------------|-------------|-------------------|--|--|
| 参照番号 | 位置 | 新 | 部品番号 | 部品名 / 規格 | 仕向 | 備考 | | | | | |
| △ △ △ △ △ △ △ △ △ | | * | H25-0105-04 | PROTECTION BAG(AC CORD) | K | | | | | | |
| | | | H52-0155-04 | ITEM CARTON BOX | | | | | | | |
| | | | J02-0323-05 | FOOT(REAR) | | | | | | | |
| | | | J02-0442-04 | FOOT(FRONT) | | | | | | | |
| | | | J02-0443-04 | FOOT(SUB) | | | | | | | |
| | | | J13-0033-15 | FUSE HOLDER | | | | | | | |
| | | | J21-4135-04 | LEAD HOLDER(PANEL) | | | | | | | |
| | | | J21-4179-04 | MOUNTING HARDWARE | | | | | | | |
| | | | J21-4181-14 | MOUNTING HARDWARE | | | | | | | |
| | | | J21-4365-03 | MOUNTING HARDWARE | | | | | | | |
| △ △ △ △ △ △ △ △ △ △ | | * | J42-0024-15 | CORD BUSHING | KP M | | | | | | |
| | | | J42-0083-05 | CORD BUSHING | | | | | | | |
| | | | J42-0085-05 | CORD BUSHING | | | TE | | | | |
| | | | J61-0307-05 | WIRE BAND | | | | | | | |
| | | | K29-4636-04 | KNOB | | | T KP EM | | | | |
| | | | L01-8462-05 | POWER TRANSFORMER | | | | | | | |
| | | | L01-8471-05 | POWER TRANSFORMER(120V) | | | | | | | |
| | | | L01-8475-05 | POWER TRANSFORMER(115/230V) | | | TEP | | | | |
| | | | N09-0372-04 | SCREW(THERMISTOR) | | | | | | | |
| | | | N09-0658-04 | SCREW(MOTOR) | | | | | | | |
| N09-0669-05 | SCREW(GND) | | | | | | | | | | |
| N09-2033-04 | SCREW(TRANSISTOR) | | | | | | | | | | |
| N14-0535-04 | NUT(TRANSISTOR) | | | | | | | | | | |
| △ △ △ △ △ △ △ △ △ △ | | * | N16-0040-46 | SPRING WASHER(DIODE) | EM | | | | | | |
| | | | N19-0642-04 | FLAT WASHER(TRANSISTOR) | | | | | | | |
| | | | N30-3004-46 | PAN HEAD MACHIN SCREW(HARDWARE) | | | | | | | |
| | | | N30-4018-46 | PAN HEAD MACHIN SCREW(DIODE) | | | | | | | |
| | | | N35-3006-41 | BINDING HEAD MACHINE SCREW | | | | | | | |
| | | | N35-3008-41 | BINDING HEAD MACHINE SCREW | | | | | | | |
| | | | N87-3006-41 | BRAZIER HEAD TAPTITE SCREW | | | | | | | |
| | | | N87-3006-46 | BRAZIER HEAD TAPTITE SCREW | | | | | | | |
| | | | N87-3008-45 | BRAZIER HEAD TAPTITE SCREW | | | | | | | |
| | | | N87-3008-46 | BRAZIER HEAD TAPTITE SCREW | | | | | | | |
| △ △ △ △ △ △ △ △ △ △ | | * | N87-3014-46 | BRAZIER HEAD TAPTITE SCREW | EM | | | | | | |
| | | | N88-3008-46 | FLAT HEAD TAPTITE SCREW(POW SW | | | | | | | |
| | | | S40-1416-05 | PUSH SWITCH | | | | | | | |
| | | | S31-2126-05 | SLIDE SWITCH | | | | | | | |
| | | | S25VB10 | DIODE | | | | | | | |
| | | | SLP144B | DIODE | | | | | | | |
| | | | 2N5885 | TRANSISTOR | | | | | | | |
| | | | X43-3030-01 | POWER SUPPLY UNIT | | | | | | | |
| | | | POWER SUPPLY UNIT (X43-3030-01) | | | | | | | | |
| | | | C1 -3 | | | | | CK45F1H103Z | CERAMIC 0.010UF Z | | |
| C4 | | | CK45F1H473Z | CERAMIC 0.047UF Z | | | | | | | |
| C5 | | | CE04EW1C331M | ELECTRO 330UF 16WV | | | | | | | |
| C6 | | | CE04EW1A470M | ELECTRO 47UF 10WV | | | | | | | |
| C7 | | | CK45F1H103Z | CERAMIC 0.010UF Z | | | | | | | |
| C8 | | | CK45F1H473Z | CERAMIC 0.047UF Z | | | | | | | |
| C9 -11 | | | C90-0814-05 | ELECTRO 4700UF 25WV | | | | | | | |
| C12 | | | CQ92M1H104K | MYLAR 0.10UF K | | | | | | | |
| C13 | | | CK45B1H102K | CERAMIC 1000PF K | | | | | | | |

L:Scandinavia K:USA P:Canada
Y:PX(Far East, Hawaii) T:England E:Europe
Y:AAFES(Europe) X:Australia M:Other Areas

△ indicates safety critical components

PS-33/53 (DC POWER SUPPLY)

× New Parts

Parts without Parts No. are not supplied

Les articles non mentionnés dans le Parts No. ne sont pas fournis

Teile ohne Parts No. werden nicht geliefert.

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-------------------------|------------------------|--------------------|
| △ C14 | | | C91-0647-05 | CERAMIC 0.01UF P | | |
| △ C15 ,16 | | | C91-1075-05 | CERAMIC 470PF K | | |
| CN1 ,2 | | | E40-3237-05 | MINI CONNECTOR(2P) | | |
| CN3 | | | E40-0470-05 | PIN ASSY | | |
| △ | | | J13-0055-15 | FUSE HOLDER | | |
| | | | J31-0502-14 | COLLAR (PCB) | | |
| | | | J42-0428-05 | BUSHING(PCB) | | |
| R1 | | | RD14BB2C391J | RD 390 J 1/6W | | |
| △ R2 | | | R92-1202-05 | FUSE R 2.2 J 2W | | |
| R3 | | | RS14KB3F121J | FL-PROOF RS 120 J 3W | | |
| R4 | | | RD14BB2C272J | RD 2.7K J 1/6W | | |
| R5 | | | RD14BB2C102J | RD 1.0K J 1/6W | | |
| R6 | | | RD14BB2C473J | RD 47K J 1/6W | | |
| R7 ,8 | | | RS14KB3A1R0J | FL-PROOF RS 1.0 J 1W | | |
| R9 | | | RD14BB2C182J | RD 1.8K J 1/6W | | |
| R10 ,11 | | | RS14KB3A331J | FL-PROOF RS 330 J 1W | | |
| R12 | | | RD14BB2C471J | RD 470 J 1/6W | | |
| R13 | | | RD14BB2C472J | RD 4.7K J 1/6W | | |
| R14 | | | RD14BB2C153J | RD 15K J 1/6W | | |
| R15 | | | RS14KB2H471J | FL-PROOF RS 470 J 1/2W | | |
| R16 | | | RD14BB2C123J | RD 12K J 1/6W | | |
| R17 | | | RD14BB2C822J | RD 8.2K J 1/6W | | |
| R18 | | | RD14BB2C333J | RD 33K J 1/6W | | |
| R19 | | | RD14BB2C392J | RD 3.9K J 1/6W | | |
| R20 | | | RS14KB3A820J | FL-PROOF RS 82 J 1W | | |
| R21 | | | RD14BB2C223J | RD 22K J 1/6W | | |
| R22 | | | RD14BB2C472J | RD 4.7K J 1/6W | | |
| VR1 | | | R12-0094-05 | TRIMMING POT.470 | | |
| VR2 | | | R12-6012-05 | TRIMMING POT.470K | | |
| D1 | | | 1S1555 | DIODE | | |
| D2 ,3 | | | DSA3A1 | DIODE | | |
| D4 | | | UZ9.1BL | DIODE | | |
| D5 | | | 1S1555 | DIODE | | |
| D7 | | | UZ15BH | DIODE | | |
| D8 | | | 1S1555 | DIODE | | |
| Q1 | | | 2SA562(Y) | TRANSISTOR | | |
| Q2 ,3 | | | 2SC2458(Y) | TRANSISTOR | | |
| Q4 | | | 2SB941(Q) | TRANSISTOR | | |
| Q5 | | | 2SC2458(Y) | TRANSISTOR | | |
| TH1 | | | 32D27 | THERMISTOR | | |
| TH2 | | | 5TP41L | THERMISTOR | | |

L:Scandinavia

U:USA

P:Canada

△印は安全部品

Y:PX(Far East, Hawaii)

T:England

E:Europe

Y:AAFES(Europe)

A:Australia

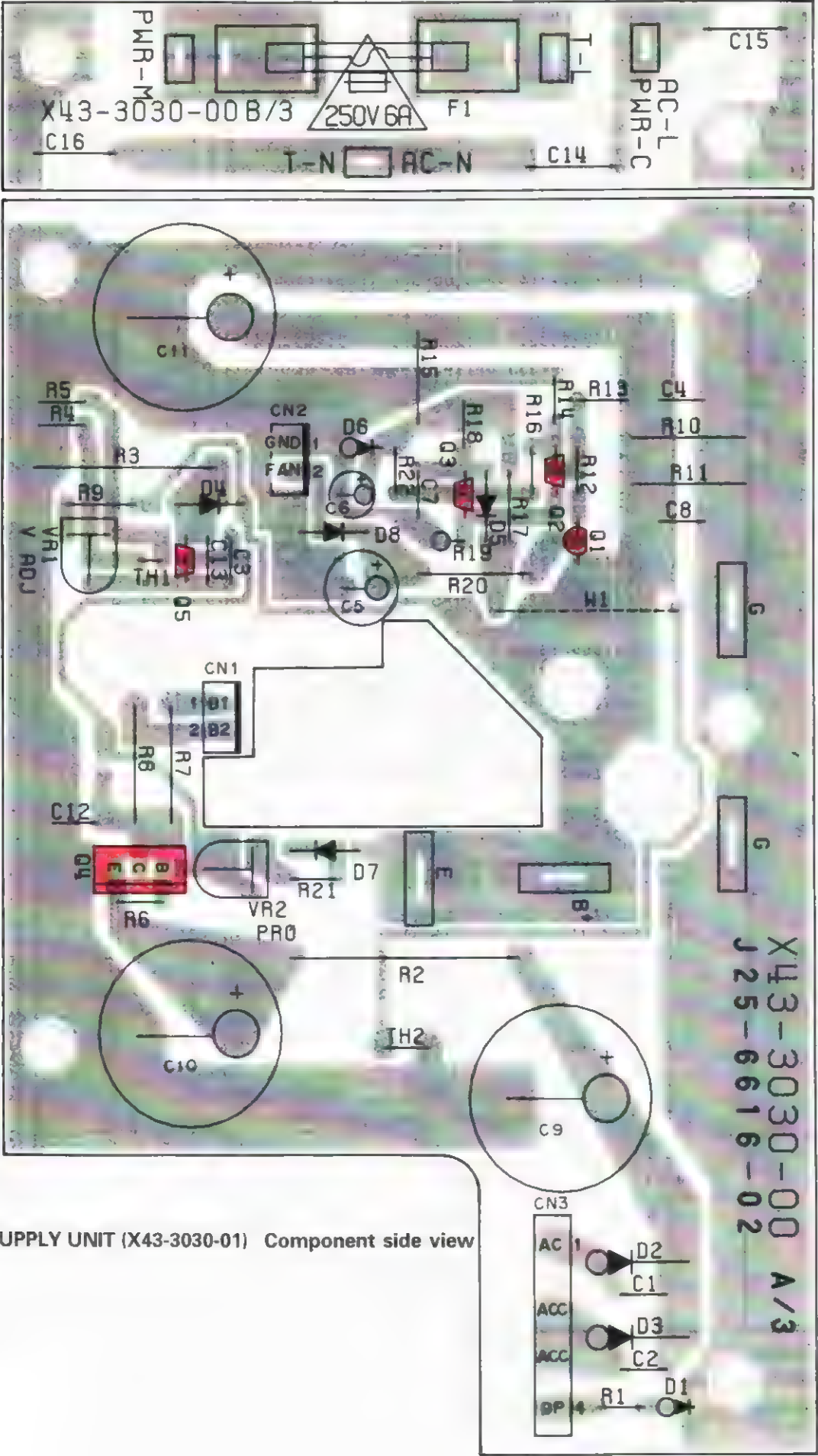
M:Other Areas

△ indicates safety critical components

TS-450S/690S

PS-33/53 (DC POWER SUPPLY)

PS-33/53 PC Board View



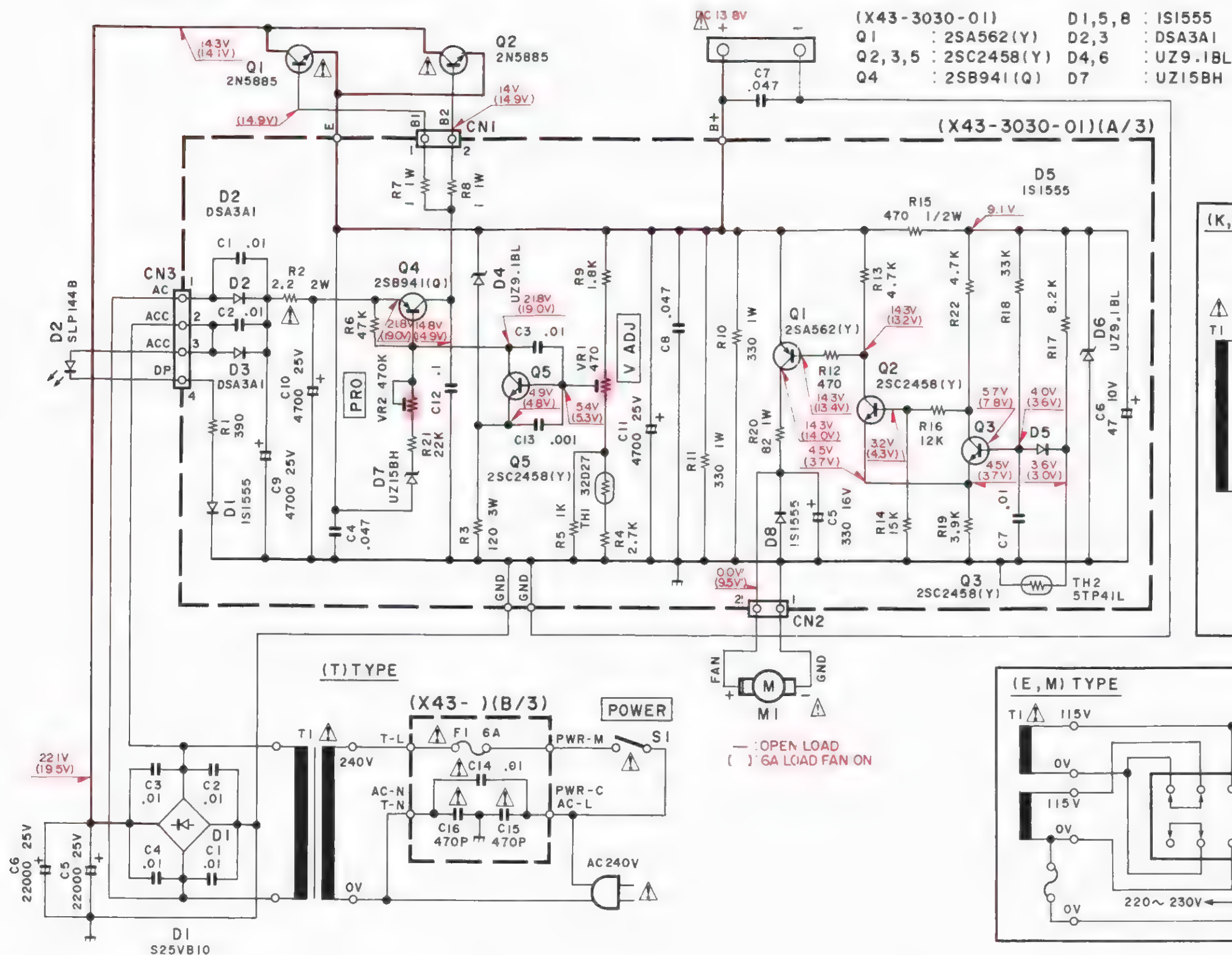
POWER SUPPLY UNIT (X43-3030-01) Component side view

- 2SA562
- 2N5885
- 2SB941
- 2SC2458

TS-450S/690S TS-450S/690S

PS-33/53 (DC POWER SUPPLY)

PS-33/53 Schematic Diagram



PS-53 (K)

PG-2X (DC POWER CORD) / SO-2 (TCXO UNIT)

PG-2X External View



SO-2 External View



SO-2 Specifications

Oscillating frequency 20 MHz
Temperature stability $\pm 5 \times 10^{-7}$ (-10°C to $+50^{\circ}\text{C}$)
Frequency stability (Long term) $\pm 1 \times 10^{-6}$ /year
Output 1 V peak-to-peak (20 k Ω /5 pF)

SO-2 Parts List

| Ref. No. | New | Parts No. | Description |
|----------|-----|-------------|--------------------|
| | | B50-8314-08 | Instruction manual |
| | | L77-1394-15 | TCXO |

TS-450S/690S

SP-23 (EXTERNAL SPEAKER)

SP-23 External View



SP-23 Specifications

| | |
|---------------------------|--|
| Speaker used | 7.5cm dia. |
| Rated input | 1W |
| Impedance | 8Ω |
| Frequency response | 300Hz to 5kHz |
| Dimensions (mm) | 123 (124) W x 96 (106) H x 235 (241) D |
| () : Projection included | |
| Weight | 1.3kg |

× New Parts
Parts without Parts No. are not supplied.
Les articles non mentionnés dans le Parts No. ne sont pas fournis.
Teile ohne Parts No. werden nicht geliefert.

SP-23 Parts List

| Ref. No. 参照番号 | Address 位置 | New Parts 新 | Parts No. 部品番号 | Description 部品名 / 規格 | Desti- nation 仕向 | Re- marks 備考 |
|------------------|---------------|-------------------|-------------------|-------------------------------|------------------------|--------------------|
| SP-23 | | | | | | |
| | | * | A01-2042-03 | METALLIC CABINET(TOP) | | |
| | | * | A01-2043-03 | METALLIC CABINET(BOTTOM) | | |
| | | | A23-1431-04 | REAR PANEL | | |
| | | * | A62-0122-03 | PANEL | | |
| | | * | B04-0414-04 | MESH PLATE | | |
| | | | B07-0613-14 | SPEAKER RING | | |
| | | | B39-0407-04 | SPACER (FOOT) | | |
| | | * | B62-0154-00 | INSTRUCTION MANUAL | | |
| | | * | B20-0208-14 | TERMINAL BOARD | | |
| | | * | B30-1629-15 | SP CABLE | | |
| | | | G53-0507-04 | PACKING | | |
| | | | H10-2513-02 | POLYSTYRENE FOAMED FIXTURE(F) | | |
| | | | H10-2514-12 | POLYSTYRENE FORMED FIXTURE(R) | | |
| | | | H12-0445-04 | PACKING FIXTURE | | |
| | | | H20-1407-03 | PROTECTION COVER | | |
| | | | H25-0077-03 | PROTECTION BAG | | |
| | | * | H52-0170-04 | ITEM CARTON BOX | | |
| | | | J02-0323-05 | FOOT | | |
| | | | J02-0409-04 | FOOT(SUB) | | |
| | | | J21-1144-34 | MOUNTING HARDWARE(SPEAKER) | | |
| | | | J21-2573-04 | MOUNTING HARDWARE(FOOT) | | |
| | | | N15-1030-46 | FLAT WASHER | | |
| | | | N30-3008-46 | PAN HEAD MACHINE SCREW | | |
| | | | N35-3006-41 | BINDING HEAD MACHINE SCREW | | |
| | | | N87-3006-46 | BRAZIER HEAD TAPTITE SCREW | | |
| | | | N87-3008-46 | BRAZIER HEAD TAPTITE SCREW | | |
| | | | T07-0224-05 | SPEAKER | | |

E: Scandinavia & Europe K: USA P: Canada W:Europe
U: PX(Far East, Hawaii) T: England M: Other Areas
UE: AAFES(Europe) X: Australia

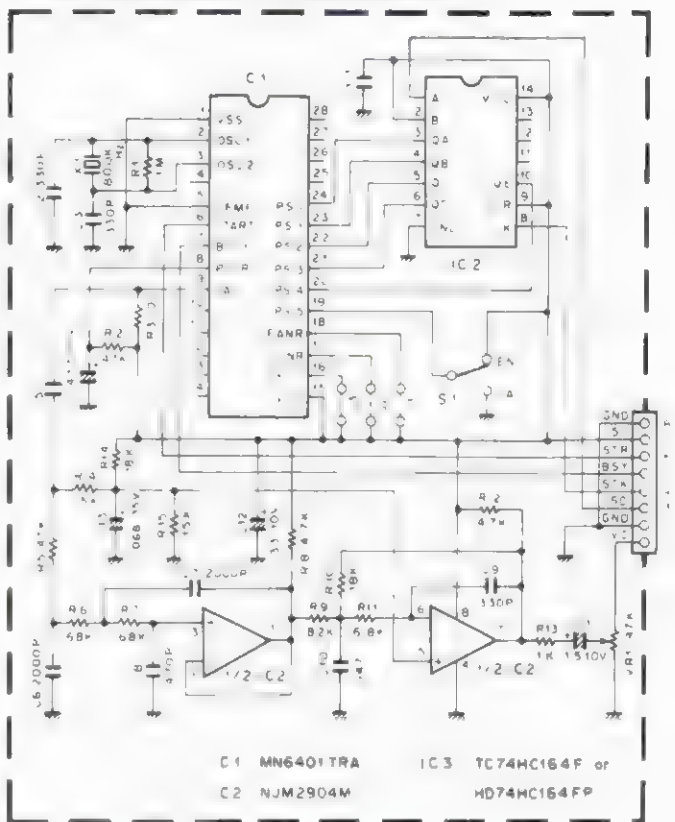
indicates safety critical components

VS-2 (VOICE SYNTHESIZER)

VS-2 PARTS LIST

| Ref. No. | New Parts | Parts No | Description |
|-------------------------------------|-----------|---------------|-----------------------|
| VS-2 | | | |
| | | B50-8095-00 | Instruction manual |
| | | G13-0645-04 | Cushion Accessory |
| | | H01-8025-03 | Item carton box |
| | | H25-0029-04 | Protection bag |
| | | N32-2004-41 | Flat head screw |
| | | N35-2604-41 | Bind head screw |
| | | X42-3000-00 | Accessory unit |
| ACCESSORY UNIT (X42-3000-00) | | | |
| C6,7 | | CC73ECH1H202J | Chip C 2000pF J |
| C2,3,9 | | CC73FCH1H331J | Chip C 330pF J |
| C8 | | CC73FCH1H471J | Chip C 470pF J |
| C12 | | CE04CW1A330M | Electro 33μF 10WV |
| C1,5 | | CK73EB1E104K | Chip C 0.1μF K |
| C10 | | CK73EB1H473K | Chip C 0.047μF K |
| C13 | | C90-0503-05 | Chip tan 0.068μF 35WV |
| C4,11 | | C92-0501-05 | Chip tan 1.5μF 10WV |
| CN1 | | E40-5022-05 | Pin ass'y (8P) |
| | | J21-4146-04 | Mounting hardware |
| X1 | | L78-0006-05 | Ceramic oscillator |
| R3 | | RK73FB2A101J | Chip R 100 J 1/10W |
| R13 | | RK73FB2A102J | Chip R 1k J 1/10W |
| R1 | | RK73FB2A105J | Chip R 1M J 1/10W |
| R4,15 | | RK73FB2A153J | Chip R 15k J 1/10W |
| R10,14 | | RK73FB2A183J | Chip R 18k J 1/10W |
| R8,12 | | RK73FB2A472J | Chip R 4.7k J 1/10W |
| R2,5 | | RK73FB2A473J | Chip R 47k J 1/10W |
| R11 | | RK73FB2A682J | Chip R 6.8k J 1/10W |
| R6,7 | | RK73FB2A683J | Chip R 68k J 1/10W |
| R9 | | RK73FB2A822J | Chip R 8.2k J 1/10W |
| VR1 | | R12-3457-05 | Trimming pot 47k |
| S1 | | S31-1418-05 | Slide switch |
| IC1 | | MN6401TRA | IC |
| IC2 | | NJM2904M | IC |
| IC3 | | TC74HC164FP | IC |
| IC3 | | HD74HC164FP | IC |

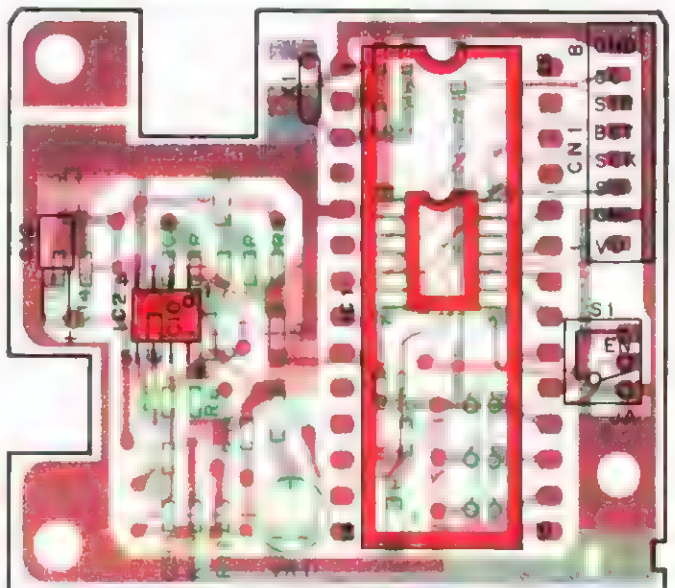
VS-2 SCHEMATIC DIAGRAM



VS-2 PC BOARD VIEW

ACCESSORY UNIT (X42-3000-00)

Component side view



OPTION FILTER

| Item | Rating |
|----------------------------|---|
| Nominal center frequency | 8830kHz |
| Center frequency deviation | Within $\pm 150\text{Hz}$ at 6dB |
| Passband width | $\pm 1.2\text{kHz}$ or more at 6dB |
| Attenuation bandwidth | $\pm 1.5\text{kHz}$ or less at 20dB $\pm 2.2\text{kHz}$ or less at 60dB $\pm 3.0\text{kHz}$ or less at 80dB |
| Ripple | 2dB or less |
| Insertion loss | 6dB or less |
| Guaranteed attenuation | 80dB or more within $\pm 1\text{MHz}$ |
| Input and output impedance | 600 Ω /15pF |

SSB Crystal filter (L71-0418-05) : YK-88S-1

| Item | Rating |
|----------------------------|---|
| Nominal center frequency | 8830kHz |
| Center frequency deviation | Within $\pm 150\text{Hz}$ at 6dB |
| Passband width | $\pm 900\text{Hz}$ or more at 6dB |
| Attenuation bandwidth | $\pm 1800\text{Hz}$ or less at 60dB |
| Ripple | 2dB or less |
| Insertion loss | Within 3dB $\pm 2\text{dB}$ |
| Guaranteed attenuation | 80dB or more in the range $\pm 2.5\text{kHz}$ to $\pm 1\text{MHz}$ |
| Input and output impedance | 600 Ω /15pF |

SSB Crystal filter (L71-0406-05) : YK-88SN-1

| Item | Rating |
|----------------------------|---|
| Nominal center frequency | 8830kHz |
| Center frequency deviation | Within $\pm 70\text{Hz}$ at 6dB |
| Passband width | $\pm 250\text{Hz}$ or more at 6dB |
| Attenuation bandwidth | $\pm 900\text{Hz}$ or less at 60dB |
| Ripple | 2dB or less |
| Insertion loss | 5dB $\pm 2\text{dB}$ |
| Guaranteed attenuation | 80dB or more in the range $\pm 2\text{kHz}$ to $\pm 1\text{MHz}$ |
| Input and output impedance | 600 Ω /15pF |

CW Crystal filter (L71-0236-15) : YK-88C-1

| Item | Rating |
|----------------------------|---|
| Nominal center frequency | 8830kHz |
| Center frequency deviation | Within $\pm 50\text{Hz}$ at 6dB |
| Passband width | $\pm 125\text{Hz}$ or more at 6dB |
| Attenuation bandwidth | $\pm 600\text{Hz}$ or less at 60dB |
| Ripple | 2dB or less |
| Insertion loss | Within 8dB $\pm 2\text{dB}$ |
| Guaranteed attenuation | 80dB or more in the range $\pm 2\text{kHz}$ to $\pm 1\text{MHz}$ |
| Input and output impedance | 600 Ω /15pF |

CW Crystal filter (L71-0407-05) : YK-88CN-1

| Item | Rating |
|----------------------------|---|
| Nominal center frequency | 455kHz |
| Center frequency deviation | Within $\pm 50\text{Hz}$ at 6dB |
| Passband width | $\pm 250\text{Hz}$ or more at 6dB |
| Attenuation bandwidth | $\pm 425\text{Hz}$ or less at 60dB |
| Ripple | 2dB or less |
| Insertion loss | 6dB or less |
| Guaranteed attenuation | 80dB or more within 100Hz to 454.4kHz 80dB or more within 456.6kHz to 2MHz |
| Input and output impedance | 2k Ω /15pF |

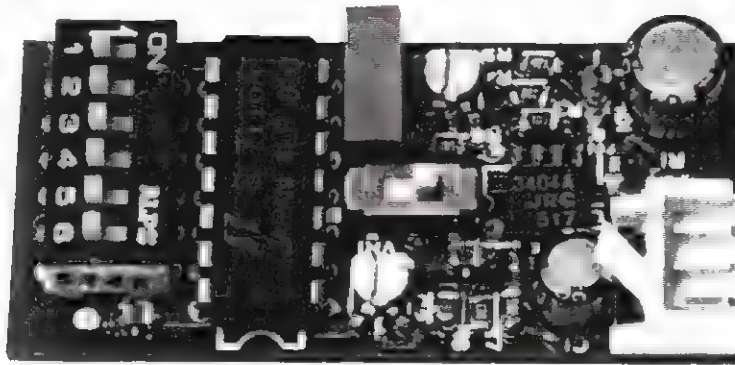
CW Crystal filter (L71-0238-25) : YG-455C-1

| Item | Rating |
|----------------------------|---|
| Nominal center frequency | 455kHz |
| Center frequency deviation | Within $\pm 50\text{Hz}$ at 6dB |
| Passband width | $\pm 125\text{Hz}$ or more at 6dB |
| Attenuation bandwidth | $\pm 250\text{Hz}$ or less at 60dB |
| Ripple | 2dB or less |
| Insertion loss | 6dB or less |
| Guaranteed attenuation | 80dB or more within 100Hz to 454.4kHz 80dB or more within 456.6kHz to 2MHz |
| Input and output impedance | 2k Ω /15pF |

CW Crystal filter (L71-0239-25) : YG-455CN-1

TU-8 (TONE UNIT)

TU-8 EXTERNAL VIEW



TU-8 SPECIFICATIONS

| | |
|--|--|
| Frequency range | 38CH in 67.0—250.3Hz and 1750Hz, 1800Hz |
| Frequency Deviation | Within $\pm 0.5\%$ |
| Max. Output Power | 2.0Vrms $\pm 5\%$ at 1800Hz/1.5k Ω |
| Operating temperature | —20°C to +60°C |
| Power Supply Voltage | 8V $\pm 5\%$ |
| Semi-conductors | ICs : 2 Diode : 1 |
| Weight | Approx. 10 grams |
| Dimensions | 45 mm W 22 mm D 8 mm H (without cushion, etc.) |

TS-450S/690S

TU-8 (TONE UNIT)

TU-8 CIRCUIT DESCRIPTION

The TU-8 is a tone unit designed for the repeater operation of the TS-140S/680S.

● Outline

1. A six position DIP switch (Fig. 1) has been provided to allow selection of the desired tone frequency, 40 different frequencies are available (See Table 1.).

Use the DIP switch and Table 1 to select the desired tone frequency.

| Freq. (Hz) | P1 | P2 | P3 | P4 | P5 | P6 | Freq. (Hz) | P1 | P2 | P3 | P4 | P5 | P6 |
|------------|----|----|----|----|----|----|------------|----|----|----|----|----|----|
| 67.0 | 1 | 0 | 0 | 0 | 0 | 0 | 136.5 | 1 | 0 | 1 | 0 | 1 | 0 |
| 71.9 | 0 | 1 | 0 | 0 | 0 | 0 | 141.3 | 0 | 1 | 1 | 0 | 1 | 0 |
| 74.4 | 1 | 1 | 0 | 0 | 0 | 0 | 146.2 | 1 | 1 | 1 | 0 | 1 | 0 |
| 77.0 | 0 | 0 | 1 | 0 | 0 | 0 | 151.4 | 0 | 0 | 0 | 1 | 1 | 0 |
| 79.7 | 1 | 0 | 1 | 0 | 0 | 0 | 156.7 | 1 | 0 | 0 | 1 | 1 | 0 |
| 82.5 | 0 | 1 | 1 | 0 | 0 | 0 | 162.2 | 0 | 1 | 0 | 1 | 1 | 0 |
| 85.4 | 1 | 1 | 1 | 0 | 0 | 0 | 167.9 | 1 | 1 | 0 | 1 | 1 | 0 |
| 88.5 | 0 | 0 | 0 | 1 | 0 | 0 | 173.8 | 0 | 0 | 1 | 1 | 1 | 0 |
| 91.5 | 1 | 0 | 0 | 1 | 0 | 0 | 179.9 | 1 | 0 | 1 | 1 | 1 | 0 |
| 94.8 | 0 | 1 | 0 | 1 | 0 | 0 | 186.2 | 0 | 1 | 1 | 1 | 1 | 0 |
| 97.4 | 1 | 1 | 0 | 1 | 0 | 0 | 192.8 | 1 | 1 | 1 | 1 | 1 | 0 |
| 100.0 | 0 | 0 | 1 | 1 | 0 | 0 | 203.5 | 0 | 0 | 0 | 0 | 0 | 1 |
| 103.5 | 1 | 0 | 1 | 1 | 0 | 0 | 210.7 | 1 | 0 | 0 | 0 | 0 | 1 |
| 107.2 | 0 | 1 | 1 | 1 | 0 | 0 | 218.1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 110.9 | 1 | 1 | 1 | 1 | 0 | 0 | 225.7 | 1 | 1 | 0 | 0 | 0 | 1 |
| 114.8 | 0 | 0 | 0 | 0 | 1 | 0 | 233.6 | 0 | 0 | 1 | 0 | 0 | 1 |
| 118.8 | 1 | 0 | 0 | 0 | 1 | 0 | 241.8 | 1 | 0 | 1 | 0 | 0 | 1 |
| 123.0 | 0 | 1 | 0 | 0 | 1 | 0 | 250.3 | 0 | 1 | 1 | 0 | 0 | 1 |
| 127.3 | 1 | 1 | 0 | 0 | 1 | 0 | 1750.0 | 1 | 1 | 1 | 1 | 0 | 1 |
| 131.8 | 0 | 0 | 1 | 0 | 1 | 0 | 1800.0 | 0 | 0 | 0 | 0 | 1 | 1 |

(1 : ON 0 : OFF)

Table 1 Program

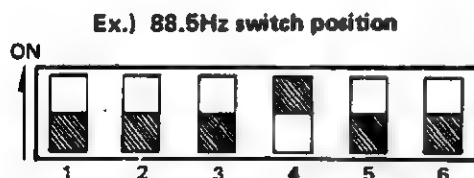


Fig. 1 DIP Switch

TU-8 ADJUSTMENT

● Deviation adjustment

The TU-8 has been present at factory for $\pm 600\text{Hz}$. The deviation is adjusted by with VR1 to Max. $\pm 2\text{kHz}$ with the deviation potentiometer full clockwise when the TU-8 is installed on the TS-140S/680S.

2. ^{*1} Tone-burst or ^{*2} continuous tone selection :
A switch is provided to allow selection of either the tone-burst or continuous tone mode.
The burst duration can be adjusted by with VR2.

*1 Tone-burst mode :

A tone will be generated for a brief period at the beginning of each transmission.

*2 Continuous-tone mode :

A tone will be generated as long as the PTT switch is depressed. Since the tone is adjusted for a sub-audible level, this should not interfere with normal communications.

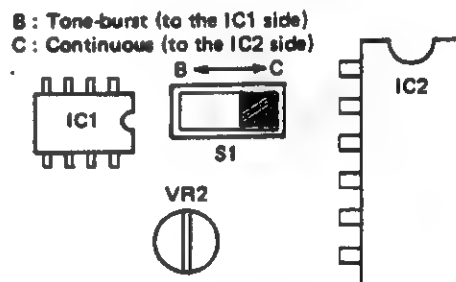


Fig. 2 Tone-burst or continuous-tone selection switch

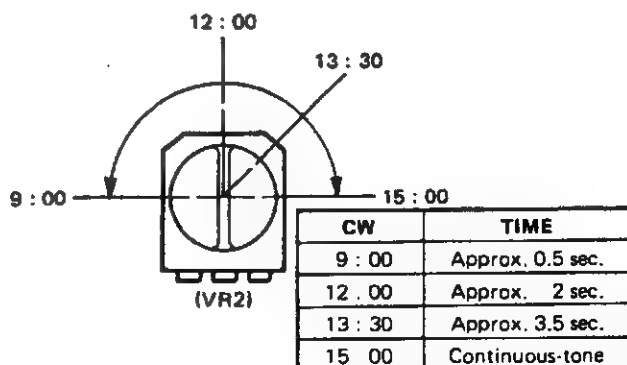


Table 2

Fig. 3 Burst time adjustment

TU-8 (TONE UNIT)

× New Parts

Parts without Parts No. are not supplied.

Les articles non mentionnés dans le Parts No. ne sont pas fournis.

Teile ohne Parts No. werden nicht geliefert.

TU-8 PARTS LIST

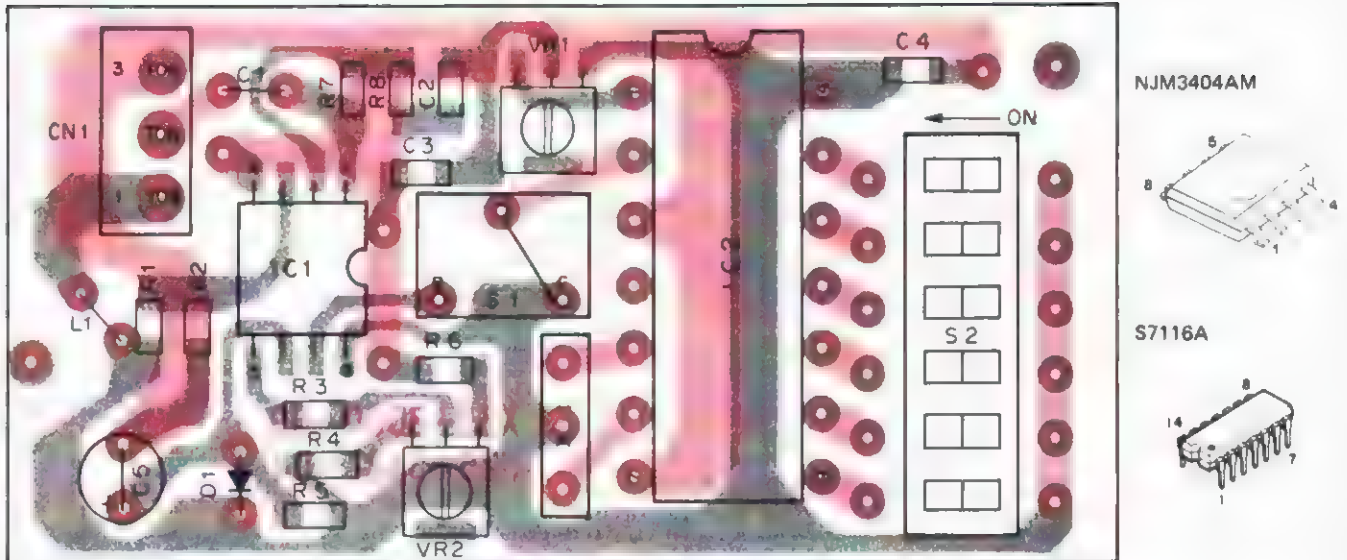
| Ref. No. | Address | New Parts | Parts No. | Description | Desti-nation | Re-marks |
|-------------------------|---------|-----------|--------------|------------------------------|--------------|----------|
| 参照番号 | 位置 | 新 | 部品番号 | 部品名 / 規格 | 仕向 | 備考 |
| TU-8 | | | | | | |
| - | | | X52-3000-00 | TONE UNIT | | |
| TONE UNIT (X52-3000-00) | | | | | | |
| C1 | | | CE04CW1A220M | ELECTR0 22UF 10WV | | |
| C2 -4 | | | CK73FB1E103K | CHIP C 0.010UF K | | |
| C5 | | | CE04CW1A470M | ELECTR0 47UF 10WV | | |
| C6 | | | CC4SSL1H102J | CERAMIC 1000PF J | | |
| L1 | | | L40-2211-17 | SMALL FIXED INDUCTOR | | |
| X1 | | | L78-0018-05 | CERAMIC OSCILLATOR (3.58MHZ) | | |
| R1 ;2 | | | RK73FB2A105J | CHIP R 1.0M J 1/10W | | |
| R3 | | | RK73FB2A103J | CHIP R 10K J 1/10W | | |
| R4 | | | RK73FB2A222J | CHIP R 2.2K J 1/10W | | |
| R5 | | | RK73FB2A473J | CHIP R 47K J 1/10W | | |
| R6 | | | RK73FB2A682J | CHIP R 6.8K J 1/10W | | |
| R7 | | | RK73FB2A105J | CHIP R 1.0M J 1/10W | | |
| R8 | | | RK73FB2A823J | CHIP R 82K J 1/10W | | |
| VR1 ;2 | | | R12-4418-05 | TRIMMING POT (50K) | | |
| S1 | | | S31-1411-05 | SLIDE SWITCH (3P) | | |
| S2 | | | S59-6401-05 | DIP SWITCH (SSGM16 6P) | | |
| D1 | | | 1S5133 | DIODE | | |
| IC1 | | | NJM3404AM | IC (OP AMP X2) | | |
| IC2 | | | S7116A | IC (TONE ENCODER) | | |

TS-450S/690S

TU-8 (TONE UNIT)

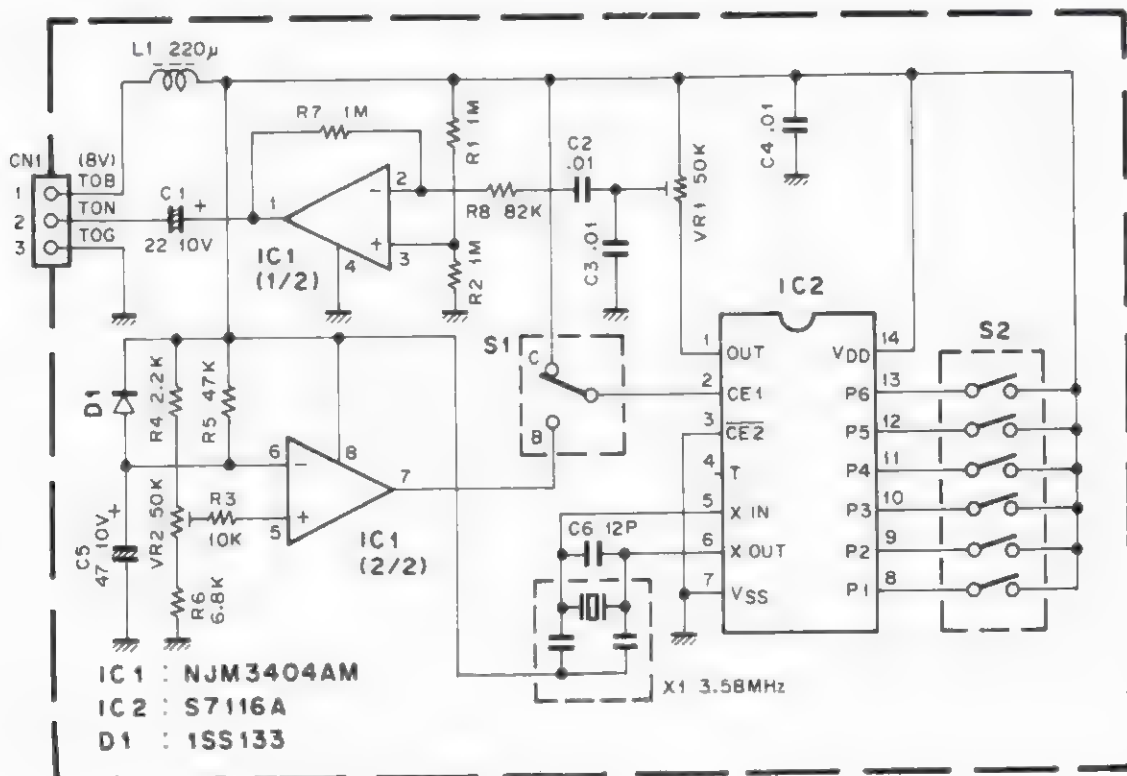
TU-8 PC BOARD VIEW

TONE UNIT (X52-3000-00) Component side view



TU-8 SCHEMATIC DIAGRAM

TONE UNIT (X52-3000-00)



SPECIFICATIONS (TS-450S)

| | | | | Specifications | |
|-------------|---|-----------------------------------|---------------------|---|-----------------|
| General | Mode | | | J3E (LSB, USB), A1A (CW), A3E (AM), F3E (FM), F1A (FSK) | |
| | Memory Channels | | | 100 | |
| | Antenna impedance | | | 50Ω (With AT-450 antenna tuner 20 to 150Ω) | |
| | Power requirement | | | 12 to 16V DC (13.8V DC reference) | |
| | Grounding | | | Negative | |
| | Current drain | Receive mode with no input signal | | 2A | |
| | | Transmit mode | | 20.5A | |
| | Operating temperature | | | -10°C to +50°C (+14°F to +122°F) | |
| | Frequency stability | | | Less than ±10PPM | |
| | Frequency accuracy | | | Less than ±10PPM | |
| | Dimensions (W x H x D) (Projections included) | | | 270 x 96 x 305 mm (10-5/8" x 3-25/32" x 12-1/64") (280 x 107 x 340 mm) (11-1/32" x 4-1/4" x 13-25/64") | |
| | Weight | With AT unit | | 7.5kg (16.5lbs) | |
| | | Without AT unit | | 6.3kg (13.9lbs) | |
| Transmitter | Frequency range | 160m band | | 1.8 to 2.0MHz | |
| | | 80m band | | 3.5 to 4.0MHz | |
| | | 40m band | | 7.0 to 7.3MHz | |
| | | 30m band | | 10.1 to 10.15MHz | |
| | | 20m band | | 14.0 to 14.35MHz | |
| | | 17m band | | 18.068 to 18.168MHz | |
| | | 15m band | | 21.0 to 21.45MHz | |
| | | 12m band | | 24.89 to 24.99MHz | |
| | | 10m band | | 28.0 to 29.7MHz | |
| | Output power (Without AT) | 1.9 to 28MHz | SSB, CW, FSK, FM | MAX | 100W |
| | | | | MIN | Less than 20W |
| | | | AM | MAX | 40W |
| | | | | MIN | Less than 10W |
| | Modulation | SSB | | Balanced modulation | |
| | | FM | | Reactance modulation | |
| | | AM | | Low level modulation | |
| | Spurious radiation | | | | Less than -50dB |
| | Carrier suppression (with 1.5kHz reference) | | | | More than 40dB |
| | Unwanted sideband suppression (with 1.5kHz reference) | | | | More than 40dB |
| | Maximum frequency deviation (FM) | | | | Less than ±5kHz |
| | Frequency response (-6dB) | | | | 400 to 2600Hz |
| | XIT variable range | 10Hz step | | More than ±1.1kHz | |
| | | 20Hz step | | More than ±2.2kHz | |
| | Microphone impedance | | | | 600Ω |

TS-450S/690S

SPECIFICATIONS (TS-450S)

| | | | Specifications |
|----------|--------------------------|---|---|
| Receiver | Circuitry | | Triple conversion superheterodyne |
| | Frequency range | | 500kHz to 30MHz |
| | Intermediate frequency | | 1st : 73.05MHz, 2nd : 8.83MHz, 3rd : 455kHz |
| | Sensitivity | SSB, CW, FSK (at 10dB (S+N)/N) | 500kHz to 1.62MHz* |
| | | | *1.62MHz to 21.5MHz |
| | | | 21.5MHz to 30MHz |
| | | AM (at 10dB (S+N)/N) | 500kHz to 1.62MHz* |
| | | | *1.62MHz to 21.5MHz |
| | | | 21.5MHz to 30MHz |
| | | FM (at 12dB SINAD) | 28MHz to 30MHz |
| | Selectivity | SSB, CW, FSK | |
| | | -6dB : More than 2.2kHz, -60dB : Less than 4.4kHz | |
| | | AM | |
| | | -6dB : More than 5kHz, -50dB : Less than 18kHz | |
| | | FM | |
| | | -6dB : More than 12kHz, -50dB : Less than 25kHz | |
| | Image ratio | | More than 70dB |
| | 1st IF rejection | | More than 70dB |
| | Notch filter attenuation | | More than 20dB |
| | RIT variable range | 10Hz step | |
| | | 20Hz step | |
| | Squelch sensitivity | SSB, CW, FSK, AM | 500kHz to 1.62MHz* |
| | | | *1.62MHz to 30MHz |
| | | FM | 28MHz to 30MHz |
| | Output | | 1.5W across 8Ω load (10% distortion) |
| | Output load impedance | | 8Ω |

Notes

1. Circuit and ratings are subject to change without notice due to advancements in technology.
2. Remember to keep the transmit output power within the power limitations of your license.
3. * : The U.S.A. version is 1.705MHz.

SPECIFICATIONS (TS-690S)

| | | | | Specifications | |
|-------------|---|-----------------------------------|---------------------|--|---|
| General | Mode | | | J3E (LSB, USB), A1A (CW), A3E (AM), F3E (FM), F1A (FSK) | |
| | Memory Channels | | | 100 | |
| | Antenna impedance | | | 50Ω | |
| | Power requirement | | | 12 to 16V DC (13.8V DC reference) | |
| | Grounding | | | Negative | |
| | Current drain | Receive mode with no input signal | | 2A | |
| | | Transmit mode | | 20.5A | |
| | Operating temperature | | | -10°C to +50°C (+14°F to +122°F) | |
| | Frequency stability | | | Less than ±10PPM | |
| | Frequency accuracy | | | Less than ±10PPM | |
| | Dimensions (W x H x D) (Projections included) | | | 270 x 96 x 328 mm (10-5/8" x 3-25/32" x 12-29/32") (280 x 107 x 351 mm) (11-1/32" x 4-1/4" x 13-13/16") | |
| | Weight | Without AT unit | | 6.9kg (15.2lbs) | |
| Transmitter | Frequency range | 160m band | | 1.8 to 2.0MHz | |
| | | 80m band | | 3.5 to 4.0MHz | |
| | | 40m band | | 7.0 to 7.3MHz | |
| | | 30m band | | 10.1 to 10.15MHz | |
| | | 20m band | | 14.0 to 14.35MHz | |
| | | 17m band | | 18.068 to 18.168MHz | |
| | | 15m band | | 21.0 to 21.45MHz | |
| | | 12m band | | 24.89 to 24.99MHz | |
| | | 10m band | | 28.0 to 29.7MHz | |
| | | 6m band | | 50.0 to 54.0MHz | |
| | Output power (Without AT) | 1.9 to 28MHz | SSB, CW, FSK, FM | MAX | 100W |
| | | | | MIN | Less than 20W |
| | | | AM | MAX | 40W |
| | | | | MIN | Less than 10W |
| | | 50MHz | SSB, CW, FSK, FM | MAX | 50W |
| | | | | MIN | Less than 10W |
| | | | AM | MAX | 20W |
| | | | | MIN | Less than 10W |
| | Modulation | | SSB | Balanced modulation | |
| | | | FM | Reactance modulation | |
| | | | AM | Low level modulation | |
| | Spurious radiation | | | | HF : Less than -50dB, 50MHz : Less than -60dB |
| | Carrier suppression (with 1.5kHz reference) | | | | More than 40dB |
| | Unwanted sideband suppression (with 1.5kHz reference) | | | | More than 40dB |
| | Maximum frequency deviation (FM) | | | | Less than ±5kHz |
| | Frequency response (-6dB) | | | | 400 to 2600Hz |
| | XIT variable range | 10Hz step | | More than ±1.1kHz | |
| | | 20Hz step | | More than ±2.2kHz | |
| | Microphone impedance | | | | 600Ω |

TS-450S/690S

SPECIFICATIONS (TS-690S)

Receiver

| | | | Specifications |
|--------------------------|-----------------------------------|---------------------|---|
| Circuitry | | | Triple conversion superheterodyne |
| Frequency range | | | HF : 500kHz to 30MHz, 50MHz : 50 to 54MHz |
| Intermediate frequency | | | 1st : 73.05MHz, 2nd : 8.83MHz, 3rd : 455kHz |
| Sensitivity | SSB, CW, FSK (at 10dB (S+N)/N) | 500kHz to 1.62MHz* | Less than 4μV |
| | | *1.62MHz to 21.5MHz | Less than 0.2μV |
| | | 21.5MHz to 30MHz | Less than 0.13μV |
| | | 50MHz to 54MHz | Less than 0.13μV |
| | AM (at 10dB (S+N)/N) | 500kHz to 1.62MHz* | Less than 32μV |
| | | *1.62MHz to 21.5MHz | Less than 2μV |
| | | 21.5MHz to 30MHz | Less than 1.3μV |
| | FM (at 12dB SINAD) | 28MHz to 30MHz | Less than 0.25μV |
| | | 50MHz to 54MHz | Less than 0.25μV |
| Selectivity | SSB, CW, FSK | | -6dB : More than 2.2kHz, -60dB : Less than 4.4kHz |
| | AM | | -6dB : More than 5kHz, -50dB : Less than 18kHz |
| | FM | | -6dB : More than 12kHz, -50dB : Less than 25kHz |
| Image ratio | | | More than 70dB |
| 1st IF rejection | | | More than 70dB |
| Notch filter attenuation | | | More than 20dB |
| RIT variable range | 10Hz step | | More than ±1.1kHz |
| | 20Hz step | | More than ±2.2kHz |
| Squelch sensitivity | SSB, CW, FSK, AM | 500kHz to 1.62MHz* | Less than 20μV |
| | | *1.62MHz to 30MHz | Less than 2μV |
| | FM | 28MHz to 50MHz | Less than 0.25μV |
| Output | | | 1.5W across 8Ω load (10% distortion) |
| Output load impedance | | | 8Ω |

Notes

1. Circuit and ratings are subject to change without notice due to advancements in technology.
2. Remember to keep the transmit output power within the power limitations of your license.
3. * : The U.S.A. version is 1.705MHz.

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